

A micro-macro sense-making model for knowledge creation and utilization in healthcare organizations

Volume 1

Louisa Mei Chun LAM

Thesis submitted in fulfillment of the requirements for the
Degree of Doctor of Philosophy

**Department of Information Studies
The Aberystwyth University, UK**

September 2014

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed _____ (LOUISA MEI CHUN LAM)

Date September 30, 2014_____

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where ***correct services** have been used, the extent and the nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

[*this refers to the extent to which the text has been corrected by others]

Signed _____ (LOUISA MEI CHUN LAM)

Date September 30, 2014_____

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organizations.

Signed _____ (LOUISA MEI CHUN LAM)

Date September 30, 2014_____

Aberystwyth University

Deposit Agreement for Electronic Theses and Dissertations

Details of the Work

I hereby deposit¹ the following item in the digital repository maintained by Aberystwyth University, and/or in any other repository authorized for use by Aberystwyth University:

Title

A micro-macro sense-making model for knowledge creation and utilization in healthcare organizations
.....

Supervisor ...Dr. Christine Urquhart; Dr. Pauline Rafferty.....

Research grant (if any)nil.....

This item is a product of my own research endeavours and is covered by the agreement below in which the item is referred to as “the Work”. It is identical in content to that deposited in the Library, subject to point 4 below.

Non-exclusive Rights

Rights granted to the digital repository through this agreement are entirely non-exclusive. I am free to publish the Work in its present version or future versions elsewhere.

I agree that Aberystwyth University may electronically store, copy or translate the Work to any approved medium or format for the purpose of future preservation and accessibility. Aberystwyth University is not under any obligation to reproduce or display the Work in the same formats or resolutions in which it was originally deposited.

AU Digital Repository

I understand that work deposited in the digital repository will be accessible to a wide variety of people and institutions, including automated agents and search engines via the World Wide Web.

I understand that once the Work is deposited, the item and its metadata may be incorporated into public access catalogues or services, such as national databases of electronic theses and dissertations.

I agree as follows:

1. That I am the author or have the authority of the author/s to make this agreement and do hereby give Aberystwyth University the right to make available the Work in the way described above.
2. That the electronic copy of the Work deposited in the digital repository and covered by this agreement, is identical in content to the paper copy of the Work deposited in the Library of Aberystwyth University, subject to point 4 below.
3. That I have exercised reasonable care to ensure that the Work is original and, to the best of my knowledge, does not breach any laws including those relating to defamation, libel and copyright.
4. That I have, in instances where the intellectual property of other authors or copyright holders is included in the Work, gained explicit permission for the inclusion of that material in the Work, and in the electronic form of the Work as accessed through the open access digital repository, *or* that I have identified and removed that material for which adequate permission has not been obtained and which will be inaccessible via the digital repository.
5. That Aberystwyth University does not hold any obligation to take legal action on behalf of the Depositor, or other rights holders, in the event of a breach of intellectual property rights, or any other right, in the material deposited.

The Student's attention is particularly drawn to the next clause

6. **That I will indemnify and keep indemnified Aberystwyth University from and against any loss, liability, claim or damage, including without limitation any related legal fees and court costs (on a full indemnity basis), related to any breach by myself of any term of this agreement².**

Signature **Date** ...September 30, 2014.....

ABSTRACT

The purpose of this research is to study how new knowledge is created, used, and shared at both micro- and macro- levels in healthcare organizations so as understand how this can improve evidence-based practice and provide new roles for information professionals to better EBM and clinical decision-making.

Using Dervin's SMM as the primary research framework, supplemented with Snowden's Cynefin Framework for data analysis, the results demonstrated that individual knowledge was created in the gap-bridging process as the sense-making moment. Situation movement state and gap-bridging strategies were two predictors for knowledge creation. The knowledge gaps were identified and a wide range of gap-bridging strategies were employed to cross the gaps and create new knowledge. This micro process of knowledge creation is linked to the organizational level thorough knowledge sharing. This whole process of knowledge creation, utilization and sharing were mapped into a new micro-macro sense-making model, showing all the barriers and enablers identified in this research. These findings have filled the missing gaps in the literature and answered the long-standing question of how new knowledge is created in organizations.

These findings would be able to shed new light to the practice of EBM. Some possible ways are to shift the attention to the use of medical knowledge, place more emphasis to the use of case-based reasoning approach, develop personalized medicine, and raise the importance of narratives in clinical practice. The new roles for information professionals in support for KM include: 1) the provision of different case-based reasoning systems; 2) use of IT tools in KM to assist clinicians to make sense of the situation; 3) taking user-centered verbing approach to organize knowledge sources; 4) building up expertise network; 5) use of narratives and storytelling for knowledge sharing; 6) engaging in virtual communities of practice; and 7) equipping library space to facilitate learning.

ACKNOWLEDGEMENTS

I appreciate very much the help of a number of people in the preparation of this PhD thesis. Without them, this work can never be completed.

My deepest gratitude goes to my primary supervisor, **Dr. Christine Urquhart**, for her valuable comments, professional guidance, patience, understanding, and unfailing support in times of my frustration throughout these long years of study. Her quick response to my submission and questions even in times of her busy research and teaching schedule has greatly encouraged me and facilitated my progress. **Mr. Urquhart's** hospitality in my stay with Dr. Urquhart such as receiving me at the coach station, preparing meals for me, gave me much warm support. Heartfelt thanks also go to my previous second supervisor, **Mr. Mohan Ravindranathan**. Though he supervised me for a short period of time, his insights inspired me to do my research in the current direction. I would like to thank **Dr. Pauline Rafferty**, who supervised me in my last year of study but was very kind to give as much support as she could.

I would also like to express special thanks to **Professor Brenda Dervin**. Though she did not know me in person at the start of my research, she gave a lot of her research materials and coding advice to me upon request. Her advice on the application of her research methodology was the most valuable. Throughout the course of this study, I have also contacted other researchers using the same methodology. **Dr. Bonnie Cheuk** was one of them. Her sharing of her experience was much appreciated. I am also grateful to the timely assistance provided by **Dr. Alison Yeomen** on the use of Nvivo.

I am also grateful to the helps and assistance offered by my colleagues and close friends in many different ways: **Ms. Ashura Lam** and **Ms. Janet Chow** for arranging interviews and ward rounds, and **Mr. Ken Chan** and **Ms. Phoenix Ho** for doing the transcriptions.

Last but not the least, I am indebted to my best friend, **Mr. Stephen Hon**, who encouraged me to commence the study and provided immense support to me when I came across much difficulties in my work during the course of this study.

TABLE OF CONTENTS

VOLUME 1

	<u>Pages</u>
Declaration	i
Deposit Agreement for Electronic Theses and Dissertations	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	v
Appendices	ix
List of Figures	x
List of Tables	xii
List of Abbreviations	xiv
Chapter 1 Introduction	1
1.1 Background to the Research	1
1.1.1 The Emergence of Evidence-Based Medicine Movement...	1
1.1.2 Limitations of Evidence-Based Medicine	5
1.1.3 Relevance of KM to address the limits of EBM	13
1.1.3.1 Tacit Knowing	14
1.1.3.2 Knowledge Sharing and Communities of Practice.....	18
1.1.3.3 Narratives and Storytelling	20
1.2 Problem Statement	22
1.3 Research Framework	25
1.4 Significance of the Study	30
1.5 Organization of the Thesis	31
Chapter 2 Literature Review – Knowledge Management	33
2.1 Nature of Knowledge	33
2.1.1 Epidemiology Revisited	34
2.1.1.1 Ancient Greek and Roman Age	39
2.1.1.2 The Enlightenment and Romantics Age	43
2.1.1.3 Contemporary Times	51
2.1.2 Current Studies on the Nature of Knowledge and Approaches of KM	84

2.1.2.1	Positivism	88
2.1.2.2	Interpretivism	100
2.1.2.3	Critical Inquiry	110
2.1.3	Working Definition of Knowledge	111
2.1.4	Definition of Knowledge Management	114
2.2	Review of Knowledge Creation Models.....	115
2.2.1	Nonaka's SECI Model	116
2.2.2	Hedlund's N-Form Organization	125
2.2.3	Boisot's I-Space Model	127
2.2.4	Demerest's Knowledge Construction Model	131
2.2.5	Choo's Sense-Making Model	132
2.2.6	Cecez-Keemanovic's Sensemaking Model.....	136
2.3	The Link between Individual and Organizational Knowledge	140
2.4	Knowledge Management in Healthcare.....	149
2.5	Conclusion – Research Gaps	154
Chapter 3	Literature Review – Sense-Making Theories As The Theoretical Framework	156
3.1	Introduction.....	156
3.2	Philosophical Origins of Sense-making Theories	157
3.3	Situations for Knowledge Creation.....	163
3.4	Nature of Knowledge and Knowing.....	184
3.5	Knowledge Creation as a Verbing and Process Approach.....	189
3.6	Knowledge Creation in Dialogue and Narratives	193
3.7	The Need to Attend to Power Issues.....	198
3.8	Individual Versus Organizational Sense-making.....	200
3.9	Sense-making as a Methodological Approach.....	207
3.9.1	Methods of Interviewing and Data Collection	209
3.9.2	Framing Research Questions	215
3.9.3	Methods of Analysis	216
3.10	Conclusion – Theoretical Framework for this Research.....	217
Chapter 4	Research Methodology	220
4.1	Introduction.....	220
4.2	Sense-Making Methodology.....	221

4.3	The Research Setting	224
4.4	Sampling Strategies	228
4.5	Recruiting Participants	230
4.6	Data Collection Methods	236
4.6.1	The Interview Method	236
4.6.2	Data Processing	241
4.6.3	Ethical Considerations	241
4.7	Data Analysis and Coding Procedure	243
4.7.1	Identifying Unit of Analysis	244
4.7.2	Identifying Coding Categories	245
4.7.3	Coding Schemes and Analysis Approach	250
4.8	Ensuring Trustworthiness of Data Analysis	263
4.9	Conclusion	268

VOLUME 2

Chapter 5	Results	269
5.1	Introduction	269
5.2	Knowledge-Creating Situations	269
5.3	Situation Movement State	278
5.4	Knowledge Gaps	286
5.5	Gap-Bridging Strategies	293
5.5.1	Relations between Gap-Bridging Strategies and Knowledge Creation	293
5.5.2	Gap-Bridging Strategies and Communication-As- Procedure Framework	307
5.5.3	Pattern of Use for Gap-Bridging Strategies	308
5.6	Sources of Inputs	314
5.7	New Knowledge Created	320
5.8	Knowledge Utilization	327
5.9	Knowledge Sharing	336
5.10	Impact of Context	346
5.11	Proposed Sense-Making Model of Knowledge Creation, Sharing and Utilization	354
5.12	Conclusion	359

Chapter 6	Discussion	360
6.1	Introduction	360
6.2	Reflection on the Practice of EBM	361
6.2.1	No consideration for the idiosyncratic needs of patients...	361
6.2.2	Limited base of evidence in EBM	362
6.2.3	Knowledge creation is situated, dialogic and process-oriented	363
6.2.4	Importance of Tacit Knowledge and Experience	364
6.2.5	Theoretical Implications	365
6.2.6	Practical Implications	367
6.3	Roles of Information Professionals in Support for KM	373
6.4	Reflection on the Application of Sense-Making Theories	382
6.4.1	Theoretical Implications	382
6.4.2	Practical Implications	387
6.5	Reflection on KM Theory	388
6.5.1	Components of Knowledge	388
6.5.2	KM models	389
6.5.3	Knowledge Sharing	391
Chapter 7	Conclusion	392
7.1	Introduction – Summary of Key Findings	392
7.2	Contribution – Significance of the Study	396
7.2.1	Theoretical Contributions	396
7.2.2	Practical Contributions	397
7.3	Limitations of the Study	398
7.4	Future Research	399
Bibliography		401
Appendices		488

APPENDICES

VOLUME 2

		<u>Pages</u>
Appendix 4.1	Sample Letter Written to Recruit Respondents.....	488
Appendix 4.2	Participant Information Sheet for Face-to-Face Interview	491
Appendix 4.3	Demographic Data of Respondents in Hong Kong's public and private hospitals	494
Appendix 4.4	Summary of Demographic Characteristics of Respondents	496
Appendix 4.5	Interview Guide	497
Appendix 4.6	Interview Consent Form	499
Appendix 4.7	Demographic Data Record Sheet for Interview Respondents	500
Appendix 4.8	An Excerpt of the Interview Transcript of a Doctor in a Public Hospital	501
Appendix 4.9	Identifying a Unit of Analysis for Interview Transcript #21	505
Appendix 4.10	Coding Schemes	509
Appendix 4.11	Codebook for Situation Focus, Situation Movement State, Knowledge Gaps and Gap-Bridging Strategies	519
Appendix 4.12	An Excerpt of Reflexive Journal	550
Appendix 5.1	Individual Odds Ratios of each gap-bridging strategy for knowledge-creating and non-knowledge-creating situations.....	553

LIST OF FIGURES

		<u>Pages</u>
Figure 1.1	Key Elements of Evidence-Based Medicine	11
Figure 1.2	An Updated Model for Evidence-Based Clinical Decision	12
Figure 2.1	Timeline of Western Epistemology from Ancient Greek to Contemporary Times	40
Figure 2.2	Polanyi's Concept of Tacit and Explicit Knowledge.....	73
Figure 2.3	Putting Polanyi's Concept of Scientific Discovery in the Perspective of Dervin's Sense-Making Triangle	75
Figure 2.4	Comparison of Different Research Paradigm Schemes	87
Figure 2.5	Skandia IC Model of KM	96
Figure 2.6	The Knowledge-creating Process: SECI model	117
Figure 2.7	A Process Model of the Knowledge-based Firm	120
Figure 2.8	Hedlund's N-Form Organization and Transformation Processes	126
Figure 2.9	Boisot's I-Space Model	128
Figure 2.10	Demerest's Knowledge Construction Model	132
Figure 2.11	Choo's Sensemaking Model	134
Figure 2.12	The Sensemaking Model of KM in Organization	137
Figure 2.13	Model of Knowledge Management in Primary Care	150
Figure 2.14	Knowledge Domain Process (KDP) model	154
Figure 3.1	Gap-bridging in the making	165
Figure 3.2	Weick's Sensemaking Model	171
Figure 3.3	The Current Cynefin Framework	177
Figure 3.4	The Cynefin Framework Developed in 1999	177
Figure 3.5	Medical Knowledge in the Cynefin Framework	183
Figure 3.6	The Sense-Making Metaphor	211

Figure 3.7	Sense-Making Triangle of Situation-Gap-Outcome	212
Figure 3.8	Circling Reality	214
Figure 4.1	Health Service Delivery Infrastructure	225
Figure 4.2	Demographic Characteristics of Respondents	234
Figure 4.3	SMM Micro-Moment Time-Line Interview	244
Figure 4.4	Coding in NVivo	248
Figure 5.1	Odds Ratios of Situation Movement State for Knowledge-creating and Non-knowledge-creating Situations	280
Figure 5.2	Odds Ratios of Broad Categories of Gap-bridging Strategies for Knowledge-creating and Non-knowledge-creating Situations	299
Figure 5.3	Odds Ratios of Selected Gap-bridging Strategies for Knowledge- creating and Non-knowledge-creating Situations	300
Figure 5.4	Proposed Micro-Macro Sense-making Model of Knowledge Creation, Utilization and Sharing in Healthcare Organizations	358
Figure 6.1	Multiple layers of Sense-making Model within a CAS framework	367

LIST OF TABLES

	<u>Pages</u>
Table 2.1 Definitions of “Knowledge” Extracted from Top KM Scholarly Publications	35
Table 2.2 Competing Epistemologies	87
Table 2.3 Definitions of Data, Information, and Knowledge	90
Table 2.4 Different Types of Organizational Knowledge	95
Table 2.5 Types, Forms and Levels of Knowledge	126
Table 4.1 Definitions of Coding Labels of Helps	259
Table 5.1 Contingency Table Showing the Relationship Between Situation Focus and Knowledge-creating Situations	271
Table 5.2 Sub-categories of Situation Focus	271
Table 5.3 Contingency Table Showing the Relationship Between Situation Movement State and Knowledge-creating Situations	279
Table 5.4 Situation Movement State of “Decision” versus Situation Focus	284
Table 5.5 Contingency Table Showing the Relationship Between Knowledge Gaps and Knowledge-creating Situations	287
Table 5.6 Distribution of Knowledge Gaps Across SMS	289
Table 5.7 Contingency Table Showing the Relationship Between Gap-bridging Strategies and Knowledge-creating Situations	294
Table 5.8 Sub-categories of Gap-bridging Strategies	294
Table 5.9 Success in Gap-bridging by Gap-bridging Strategy “Dealing with Information”	303
Table 5.10 Distribution of Gap-bridging Strategies Across Selected Knowledge Gaps	313
Table 5.11 Distribution of Sources of Inputs Across Knowledge-creating and Non-knowledge-creating Situations	315
Table 5.12 Sub-categories of Sources of Inputs	317
Table 5.13 Percentage Distribution of New Knowledge Created	321

Table 5.14	Distribution of Helps Across All Knowledge-creating and Non-knowledge-creating Situations	328
Table 5.15	Distribution of Hindrance Across All Knowledge-creating and Non-knowledge-creating Situations	329
Table 5.16	Distribution of Top Six Helps Across All Knowledge Gaps	331
Table 5.17	Inter-professional and Intra-professional Sharing.....	337
Table 5.18	Knowledge Sharing Strategies	338

LIST OF ABBREVIATIONS

CAS	Complex Adaptive System
COP	Communities of Practice
D-I-K	Data-Information-Knowledge
EBM	Evidence-Based Medicine
ENT	Ear, Nose and Throat
HA	Hong Kong Hospital Authority
IC	Intellectual Capital
ICT	Information, communication and technology
ICU	Intensive Care Units
IS / IT	Information Systems / Information Technology
IT	Information Technology
JTB	Justified true belief
KBM	Knowledge-based medicine
KDP	Knowledge Domain Process
KM	Knowledge Management
KT	Knowledge Translation
LPP	Legitimate Peripheral Participation
NBM	Narrative based medicine
NEBM	Narrative evidence-based medicine
NHS	UK National Health Service
OCKD	Organization Current Knowledge Design
RCT	Randomized Controlled Trials
SECI	Socialization, Externalization, Combination, Internalization

SLC	Social Learning Cycle
SMM	Sense-Making Methodology
SMS	Situation Movement State
UK	The United Kingdom
US	The United States
USSR	The Union of Soviet Socialist Republics

CHAPTER ONE

INTRODUCTION

We are drowning in information, and starving for knowledge.

Naisbitt

The gap between what we know and what we do yawns like the Grand Canyon, but it can and must be bridged.

Sir Muir Gray

1.1 Background to the Research

Health information professionals are concerned with providing the best information services to assist healthcare professionals to make informed clinical decisions for optimal patient care. To heal a patient's illness has always been the core value of medicine since the Hippocrates of Kos, "the Father of Medicine". Clinicians nowadays are still exploring the best model of care given the great resource constraints. The Evidence-Based Medicine (EBM) movement can be said to be a response to this call. However, this new paradigm is also faced with epistemological, philosophical, ethical and practical limitations. Some of these limitations sparked my interest, as I wished to explore how the theory of knowledge management (KM) might be used to provide a deeper understanding of the clinical decision making process in the hope that this will shed new light on the practice of EBM and the role of information professionals in supporting EBM.

1.1.1 The Emergence of Evidence-Based Medicine Movement

In the Western world, clinical practice for most of the 20th century was dominated by the "biomedical model" which "treated medicine as the application of biology and basic sciences to the problems of disease" and "the term disease was restricted to unique pathophysiological

malfunctions that could be connected logically to the patient's signs and symptoms" (Henry, 2006, p. 191). Clinical knowledge is founded on inductive reasoning whereby a physician infers diagnosis from a set of symptoms through meticulous observation of the patient's problems and understanding of the pathophysiologic mechanisms of diseases (Djulbegovic, Guyatt, & Ashcroft, 2009, p. 163). Clinical experience and expertise of individual physicians are required to make informed decisions. This naturally leads to the entrenchment of individual authority or a panel of experts to provide guidelines for clinical practice (Evidence-Based Medicine Working Group, 1992).

This biomedical approach that is based on "clinical judgment" or "the art of medicine" worked well until the early 1970s when some major problems began to emerge. First, there was mounting evidence showing great variations in clinical practice across different countries (McPherson, 1990) and different provinces (Health Services Research Group, 1992, p. 467) and states within a country (Wennberg & Gittelsohn, 1973; Wennberg & Gittelsohn, 1982). It was believed that this phenomenon was a direct result of the idiosyncratic and subjective nature of clinical judgment. In fact, many researchers discovered that the variations correlated more strongly with differences in physicians' practice style than with differences among patients (Wennberg & Gittelsohn, 1973). People began to question the validity of using traditional clinical authority as the basis for clinical decisions making.

Second, the quality of clinical services was also called into question. A number of studies found that a large proportion of some surgical procedures were considered inappropriate even by the standards of medical experts, and many common medical treatments were not rigorously validated (Chassin et al., 1987; Kahn et al., 1988; Park et al., 1989). Many clinical services were underused, overused or misused. The situation was so serious and extensive

that the health of a lot of Americans was harmed (Chassin, Galvin, & National Roundtable on Health Care Quality, 1998, p. 1000). Many intellectuals were increasingly concerned about the biases in expert opinions and errors in clinical reasoning. There was a growing demand for more informed clinical decision making not relying on the traditional biomedical paradigm, as applied by the individual clinicians, based on their own experience.

Third, the gap between clinical research and practice was widening. It was estimated that only 10 - 20% of medical practices were based on randomized clinical trials (RCT) (Committee for Evaluating Medical Technologies in Clinical Use, 1985, p. 5). This could be attributed to the fact that many research studies at that time were poorly designed. Reports abound of researchers using the wrong techniques either wilfully or in ignorance, adopting the right techniques wrongly, misinterpreting their results, reporting their results selectively, citing the literature incompletely, or drawing unjustified conclusions (Altman, 1994, p. 283). But even when there were vigorous research studies, it would take decades for them to be implemented. The findings by James Lind of the effectiveness of lemon juice for scurvy was not adopted until 50 years later; the discovery by Ignatz Semmelweis of the efficacy of hand-washing in chloride of lime in reducing maternal mortality was not put into practice for 30 years; and the demonstration of the ineffectiveness of bloodletting for pneumonia by Pierre Louis in 1835 was not recognized until the early 20th century (Doherty, 2005).

EBM, a term officially coined by the School of Medicine at McMaster University in 1992, was born in reaction to this atmosphere of inconsistent clinical practice, substandard care and the uptake of unproven interventions. To address the problems of the old days, EBM emphasizes the use of scientific evidence to replace “intuition, unsystematic clinical experience, and pathophysiologic rationale” of the former paradigm in clinical reasoning

(Evidence-Based Medicine Working Group, 1992, p. 2420). It was hailed as a new paradigm shift. Under the strong advocacy of three pioneers: Archie Cochrane in the United Kingdom (UK), Alvan Feinstein in the US and David Sackett in Canada (Daly, 2006), the new approach looks to the principles of clinical epidemiology and biostatistics for effective ways of appraising the validity and relevancy of medical literature for patient care and puts high values on the power of systematic reviews and RCTs as the gold standard for clinical decision making. In practical terms, the EBM approach advocates a five-step linear and objective methodology to manage clinical problems: 1) formulating relevant and answerable questions from clinical problems; 2) searching for evidence; 3) appraising the evidence for its validity and relevance; 4) applying the evidence into patient problem using clinical experience and judgment, and 5) evaluating the effectiveness and efficiency of the process for continuous improvement (Sackett, Richardson, Rosenberg, & Haynes, 1997, p. 3).

It is undeniable that the movement gained rapid popularity among academicians, medical educators and politicians. The number of citations of the term “evidence-based medicine” in MEDLINE grew dramatically from 6 in 1993 to 24,692 in 2007 (Andersson et al., 2007, p. S64). Within a short time, “the principles of evidence based medicine have become core concepts of undergraduate, postgraduate, and continuing medical education, and courses, workshops, and online resources have proliferated” (Guyatt, Cook, & Haynes, 2004). Hundreds of books and thousands of journal articles were published elaborating the idea. Many evidence-based practice centers were established in US and UK. Its contribution to the effectiveness of patient care is enormous. Without it, most women with early breast cancer would still be undergoing mastectomy instead of lumpectomy and radiation; many babies born prematurely would not be saved from respiratory distress syndrome by having their mothers to take corticosteroids; pregnant women in Boston might still be taking

diethylstilbestrol to prevent miscarriage and to find that many of their children would be developing reproductive abnormalities and cancer; television advertisements might still influence the choice of a drug to help prevent a second fracture in elderly women; and significant health resources amounting to US\$1.4 trillion could not have been saved from applying AIDS research, and, what was more, the cost of treating cardiovascular patients could not be reduced by 35% (Dickersin, Straus, & Bero, 2007). The influence of EBM was so huge that it was acclaimed as the idea of the year 2001 by *The New York Times* (Hitt, 2001, p. 68).

1.1.2 Limitations of Evidence-Based Medicine

The strong popularity of EBM is, however, coupled with equally fierce criticisms. So far, EBM has not been totally accepted by practicing clinicians. While nobody would say that their practices were not evidence-based, some measures of “commitment” to EBM such as working knowledge of EBM terminology, the use of practice guidelines and frequent consultations of the Cochrane database illustrated that they have not fully incorporated EBM into their clinical practices (Miles, Loughlin, & Polychronis, 2007, p. 482). It is not my intention to negate the value of EBM in healthcare as it demonstrably does bring about a lot of improvement to patient care and clinical practice. But it should also be recognized that it also “takes for granted incorrect presuppositions about medical knowledge and practice that render its current conceptualization incapable of being the overriding paradigm for patient-centered medical care” (Henry, Zaner, & Dittus, 2007, pp. 292 - 293). Many people have criticized and debated hotly the various limitations of EBM (Au, 2000, 2002; Braude, 2009; Charlton & Miles, 1998; Cohen, Stavri, & Hersh, 2004; Djulbegovic, Guyatt, & Ashcroft, 2009; Dopson, Locock, Gabbay, Ferlie, & Fitzgerald, 2003; Feinstein & Horwitz, 1997; Haynes, 2002; Henry, 2006; Henry et al., 2007; Kulkarni, 2005; Malterud, 1995, 2001; Miles,

2009a; Miles et al., 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2006, 2007, 2008; Thornton, 2006; Tonelli, 1998). I intend, however, to focus the discussion on its epistemological and the related philosophical problems, which is the interest of this thesis.

Questionable epistemological foundation of EBM

The controversies surrounding EBM are mainly rooted in the nature of the term “*evidence*”.

When the EBM concept was first contemplated, it was defined in this way:

...evidence based medicine is rooted in five linked ideas: firstly, clinical decisions should be based on the best available scientific evidence; secondly, the clinical problem – rather than habits or protocols – should determine the type of evidence to be sought; thirdly, identifying the best evidence means using epidemiological and biostatistical ways of thinking; fourthly, conclusions derived from identifying and critically appraising evidence are useful only if put into action in managing patients or making healthcare decisions; and, finally, performance should be constantly evaluated (Davidoff, Haynes, Sackett, & Smith, 1995, p. 1085).

The so-called “best available scientific evidence”, though not clearly explained in this definition, is described in the authoritative manual of EBM, *Users’ Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice*, to mean results of studies carried out by those research methods ranked at the top level of the following “evidence hierarchy”:

- ◆ N-of-1 randomized trial
- ◆ Systematic reviews of randomized trials
- ◆ Systematic review of observational studies addressing patient-important outcomes
- ◆ Single observational study addressing patient-important outcomes
- ◆ Physiological studies (studies of blood pressure, cardiac output, exercise capacity, bone density)

◆ Unsystematic clinical observations (Guyatt et al., 2008)

The epistemology of EBM is founded on the premise that the evidence as produced by the highly ranked research methods like RCTs and systematic reviews is the least biased, most objective and highly reproducible, and thus could arrive at more rational decisions than those that depend on subjective opinions of experts which will result in wide variations in the care of patients. Such reliance on empiricism and the elevation to primary importance of RCTs and systematic reviews over other forms of evidence like clinical judgment, intuition and experience often render the epistemological foundation of EBM as anti-scientific (Charlton & Miles, 1998; Braude, 2009; Haynes, 2002). In the philosophy of science, the positivistic approach of EBM that treats “evidence” as facts and empirical observations and that the medical knowledge so derived from these evidences as objective, unbiased and value-free has been demonstrated by post-positivists and phenomenologists as problematic (Goldenberg, 2006). It has been shown that scientific observation is theory-laden and cannot be separated from the personal interpretation and biases of the observer. The data so gathered can also support numerous or even contradictory theories. The assumed objectivity of empirical evidence and its direct relations with one correct theory are thus no longer tenable.

On the other hand, the observational studies of individual human body to understand the basic mechanisms of disease that underpin traditional medicine can be conducted by instruments that are both objective and bias free (Haynes, 2002). This leads to the criticisms that the contribution of basic sciences to medical advances was ignored in EBM (Charlton & Miles, 1998). In the present pluralistic world, is it too simplistic for EBM adherents to place medical practice in the dichotomy between objectivity and subjectivity, rationality and irrationality, universality and particularity? Are the paradigms of basic sciences that underpin

traditional medicine and the reliance of EBM on applied research mutually exclusive? Many seem to concur with the view of Au (2002) that “heterogeneity in medicine is a clinical reality; the real task is to take a close look for explanations of variation, not to get rid of it” (p. 304).

Narrow conception of evidence

Relating to the questionable epistemological foundation of EBM is the narrow definition of evidence in EBM. The fact that the definition only includes solely clinical research and excludes other types of evidence such as pathophysiologic knowledge unless the more highly ranked information in the evidence hierarchy is not available carries an implied presumption that RCTs and systematic reviews are more reliable than, and superior to, other research methods. However, Senn (2009) has pointed out from the statistical point of view various double counting problems of studies included in meta-analysis and suggested different measures to improve their reliability. There were also findings showing that RCTs on the same research question did not agree with each other; the result of large RCTs may conflict with meta-analysis of smaller studies, and observational studies would be better than RCTs in some circumstances (Kulkarni, 2005, p. 258; Haynes, 2002; Sehon & Stanley, 2003).

Information in the lowermost rung of the evidence hierarchy has its own role to play in medicine. Clinical reasoning is a complex process requiring a broad spectrum of information and data. RCTs can at best provide epidemiological and statistical data which are not sufficient for the wide varieties of clinical situations. The patient’s clinical state, co-morbidities, personal preference and compliance to the prescribed treatment are sometimes more crucial to determine the degree of adjustment that should be made to the current indicated treatment. The decision to start a new therapy will also depend on individual

pathophysiologic status, not on published evidence (Feinstein & Horwitz, 1997, p. 532). In addition, RCTs are not always available and sometimes lacking for rare diseases not amenable to large-scale trials. Individual clinicians' judgment and experience become the only resort.

Perhaps, the term "evidence" is a misnomer. To clinicians, it can be referred to any fact or proof helpful to clinical practice. The fault of both the advocates and opponents of EBM is that they cannot consistently differentiate between the everyday meaning of evidence and the evidence of evidence-based medicine (Henry et al., 2007, p. 293). While some critics suggested renaming "evidence", thoughts should be given to the more important question of what actually constitutes evidence. One such attempt to address this issue was Tonelli's (2006) proposal of the casuistic or case-based approach to include, on top of empirical evidence, experiential evidence, pathophysiological rationale, patient goals and values, and system features such as economic, logistic, legal and cultural barriers or facilitators of care as relevant elements in clinical decisions. This also concurs with the view of phenomenologists who argue that "patient's self-understanding and experience of illness also offers a legitimate source of relevant medical knowledge" (Goldenberg, 2006, p. 2628). The interest of this thesis is to explore further into this epistemological question using the theories of KM.

Reductionism in scientific methods

Implicit in the universality claim of the EBM conception is the problem of reductionism. Many people have commented that, given the biological differences of individual patients and social-cultural variations in different locations, conclusions drawn from EBM's population-level data may have limited relevance to treatment decisions for individual patients (Haynes, 2002; Henry et al., 2007; Cohen et al., 2004, Au, 2000, 2002). In order to

apply the principles of epidemiology and enable pooled statistical analysis, EBM tends to simplify the question asked by ignoring details and differences, and to reduce medical practice to linear steps and universal rules on the assumption that “all real knowledge must be wholly explicit and formalizable” (Henry, 2006, p. 205). The subjects in the empirical research are assumed to be homogeneous; sub-group analysis to identify particulars is often found wanting as trials are usually set up to exclude patients with other conditions. The resulting uniformity in medical practice is unable to accommodate the situated needs of patients and the many clinical skills and judgments that must be evoked for the applicability of evidence. It is right for Henry et al. (2007, pp. 293 - 294) to argue that the failure of EBM was not that its formal rules lacked sufficient details, but because many medical concepts like “deep understanding” and “clinical judgment and expertise” could not be explained within EBM’s epistemological framework.

Paradox in the philosophy of EBM

In response to these criticisms, Sackett, the Father of EBM, together with Rosenberg, Gray, Haynes, and Richardson (1996) put forward another definition of EBM in an attempt to dilute the importance of evidence. EBM was defined as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” (p. 71). Two more elements of clinical circumstances and patients’ preference are added to this widely-known definition, which is conceptualized in Figure 1.1 below:

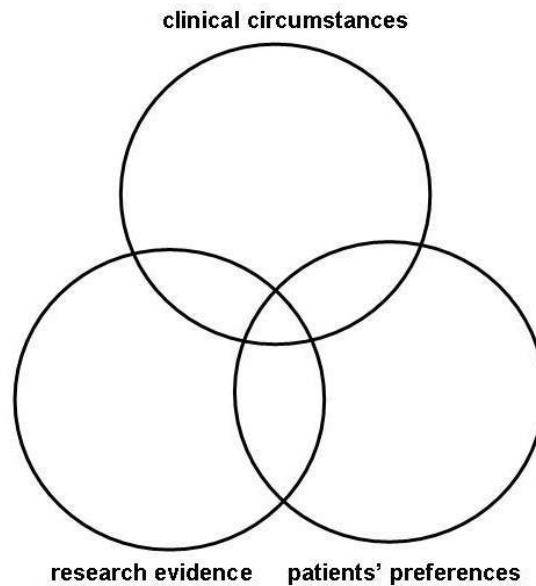


Figure 1.1 Key Elements of Evidence-Based Medicine (Haynes, 2002, p. 5)

EBM is interpreted as these three key elements intertwined together. However, it has not stated clearly how research evidence can be integrated with patients' clinical conditions and patients' preferences, "except that 'clinical judgment and expertise' are essential to success" (Haynes, 2002, p. 4). Sackett et al. (1996) emphasized that clinical expertise "decides whether the external evidence applies to the individual patient at all and, if so, how it should be integrated into a clinical decision" (p. 72). This is where the paradox of EBM lies. The gold standard evidence is privileged over clinical expertise but the applicability of gold standard evidence in treatment decisions relies in turn on the clinical expertise they try to avoid in the first place. This reflects the failure of EBM to provide clinicians with any rule of guidance in the choice of the right "evidence" for the right kind of clinical situations. Such choice, according to Urquhart (1998), requires clinicians to operate near the analytical pole of the Hammond's Cognitive Continuum and be able to integrate that mode of thinking with their intuitive judgment at the other pole, "a feat that might be considered quite difficult" (p. 427).

This handicap is not corrected in the further revision of the definition that becomes “the integration of best research evidence with clinical expertise and patient values” (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000, p. 1; Strauss, Richardson, Glasziou, & Haynes, 2005, p. 1). While this more advanced concept as depicted in Figure 1.2 below gives more emphasis on clinical expertise as the fourth element to “balance the patient’s clinical state and circumstances, relevant research evidence, and the patient’s preferences and actions if a successful and satisfying result is to occur” (Haynes, Devereaux, & Guyatt, 2002, p. 37), it remains unclear by what process this can be achieved (Charon & Wyer, 2008). Tonelli (1998) stated, “If it is to be meaningful, EBM must specifically address how to integrate various types of medical knowledge” (p. 1235). This unanswerable question provides the genesis of this thesis and it is believed that KM may provide the direction.

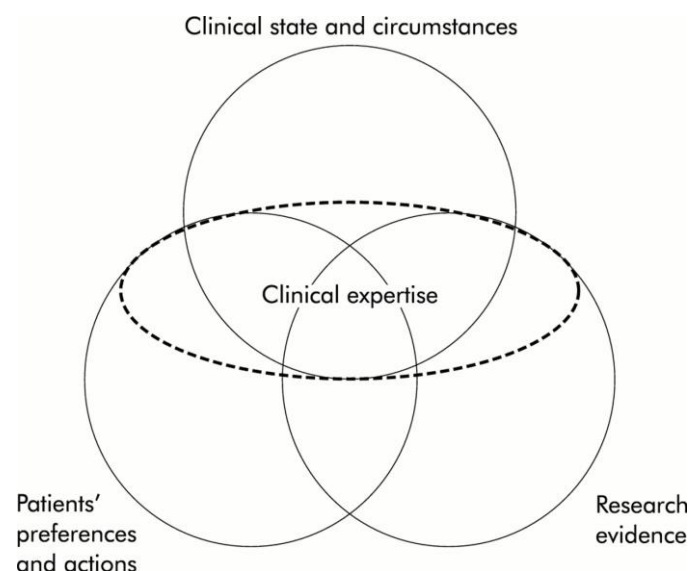


Figure 1.2 An Updated Model for Evidence-Based Clinical Decision (Haynes et al., 2002, p.37)

In sum, EBM emerges as a response to the problems underpinning the biomedical model. Yet, it also places clinical medicine in the dichotomy between subjectivity and objectivity,

uncertainty and certainty. It fails to recognize that the practice of medicine has a lot of grey zones (Naylor, 1995) and its excessive stress on objective evidence over other non-quantifiable evidence raises a number of epistemology questions. The whole philosophy is placed on a fragile groundwork with narrow conception of evidence, reductionism in methodology and paradox in principles. In short, the limits of EBM are on its failure to explore into different types of knowledge. The concepts of KM may provide a new perspective to address these issues so that EBM can be more effectively and sympathetically implemented.

1.1.3 Relevance of KM to address the limits of EBM

KM has emerged as a new management philosophy in the business world to enhance the competitive advantages of companies at about the same time that EBM has attracted increasing attention in the healthcare sector. The three KPMG consecutive surveys conducted in 1998, 2000 and 2002 on the acceptance of KM amongst top organizations in US, UK and Europe showed that the number of companies recognizing the importance of KM grew rapidly from the initially 43% of the top 100 UK companies (KPMG Management Consulting, 1998, p. 1) to 81% of the leading 423 organizations in US, UK and Europe (KPMG Consulting, 1999, p. 1) to 80% of the top 500 companies in UK and Europe in 2002 (KPMG Consulting, 2000, pp. 4 - 5). Knowledge was considered a strategic resource. The practice of KM was approaching a higher maturity level. The top management was more involved and the scope of KM was extended. In the healthcare sector, KM is also increasingly acknowledged as an extension of EBM and is promoted to integrate with evidence-based practice (de Brun, 2007, p. 181; Bali, Dwivdei, & Naguib, 2005; Fennessy, 2001; Gabbay et al., 2003; Gabbay & le May, 2004; Harding & Wales, 2007; Russell, Greenhalgh, Boynton, & Rigby, 2004; Sanders & Heller, 2006; Wickramasinghe, Sharma, &

Reddy, 2005, p. 134; Wyatt, 2001). Cheng (2006) drew an analogy between the D-I-K (Data-Information-Knowledge) framework of KM and the five main stages of EBM. Miettinen, Bachmann and Steurer (2008) clearly pointed out the need to move away from EBM to knowledge-based medicine (KBM) that is characterized by “the adoption of a tenable conception of the requisite knowledge base of medicine... – practical and rational in form, typical of top experts in content, and codified in cyberspace for as-needed retrieval in the practice” (p. 771). Even the die-hard protagonists of EBM recognized the research-practice gap of EBM and the importance of knowledge in its practice. Gray (1998) called for the need of a chief knowledge officer to manage the diverse range of knowledge of modern healthcare organizations. Straus et al. (2005, p. 8) and Haynes (2007) espoused “knowledge translation” as a new strategy in bridging the knowledge-to-practice gap of EBM. However, this so-called new strategy is just an old wine in a new bottle; a more fundamental approach involving a new mindset is needed if KM is to be wholly integrated into medical practice.

KM has been defined in many different ways (Alvesson & Kärreman, 2001; Dervin, 1998; Nonaka & Takeuchi, 1995; Davenport & Prusak, 1998; Firestone & McElroy, 2003, pp. 60-87; Jennex, 2007; Snowden, 2002; Venters, 2001), but there is still no universally accepted understanding of the concept. This will be thoroughly reviewed in Chapter Two. For the purpose of this Chapter, it is simply necessary to highlight from the literature areas in which KM concepts are found directly relevant to the improvement of EBM practice.

1.1.3.1 Tacit Knowing

The role of tacit knowing in getting clinical evidence implemented is widely discussed in the literature. Most KM practitioners, the representative of whom is Nonaka and Takeuchi (1995), draw on the concept of tacit knowing and tacit knowledge from the Hungarian

physical chemist, economist and philosopher, Michael Polanyi, and develop their own theories beyond Polanyi's original formulation. They mistakenly interpret that knowledge can be categorized into tacit and explicit that are opposite to each other. As will be discussed in Chapter Two, in Polanyi's theory of knowledge, tacit knowledge is inexpressible. It functions implicitly, subsidiarily and unspecifiably at the periphery of people's attention to allow them to understand the world around them (Henry, 2006; Henry et al., 2007). Because the use of tacit knowledge is beyond one's focal awareness, it is vividly described as "we know more than we can tell" in Polanyi's words (1966, p. 4). All knowledge including explicit knowledge has its tacit dimension. Explicit knowledge is "capable of being clearly stated (Polanyi, 1966, p. 22). The content and use of explicit knowledge is subject to focal awareness. Yet, underlying this consciousness is an ineliminable tacit knowledge, which permits the explicit knowledge to function. The relation between tacit and explicit knowledge can be "understood as a functional distinction analogous to the background-foreground relationship in Gestalt psychology" (Henry et al., 2007, p. 294). "All knowledge ... is either tacit or rooted in tacit knowledge" (Polanyi, 1969c, p. 195); a pure form of explicit knowledge is unthinkable. Thus, according to Polanyi, tacit and explicit knowledge are not dichotomous; tacit knowledge will act as the background to make possible the explicit dimension of human knowledge, and there is no such thing as "objective knowledge". Decisions can be made at an explicit level, but a wholly explicit system of knowledge is impossible.

Tacit knowing is relevant to the practice of clinical medicine in many ways. Polanyi (1966) often quoted the example of the use of an ultrasound probe by an ultrasonographer to illustrate the role of tacit knowledge in the acquisition of clinical skills. When the ultrasonographer employed a probe to explore the interior of a cavity, he would concentrate

focally on the sonograms without noticing how he moved the probe. His tacit knowledge of how to control the probe would directly affect the explicit image he saw. But this tacit knowledge was relegated to the background or subsidiary when he was attending to the image resulting from the tacit knowledge of using the probe. The explicit focus on the probe, on the other hand, would preclude the explicit knowledge of the image. This affirms Polanyi's belief that all explicit knowledge and purposeful actions require a foundation of tacit knowledge for meaning and coherence (Henry, 2006, p. 189).

Besides the acquisition of physical clinical skills, Goldman (1990, p. 48) argued that tacit knowledge also played a substantial role in the clinicians' mental operations such as clinical judgment. In producing a clinical judgment, the explicit knowledge gathered from all sorts of facts, rules and medical information is of course important. But it is the underlying tacit component of knowledge, the know-how, which enables the clinician to use the explicit component of knowledge, the know-what, to interpret the relevance of the explicit clinical rules to a given problem and integrate the appropriate data (Goldman, 1990, pp. 52 - 53). Henry (2010, p. 293) used the diagnosis of Bell's palsy to elucidate the impossibility of making sense of a neurological exam without tacit awareness of the patient's body parts and how they are connected. At the same time, clinical reasoning is an art that involves dynamic and complex clinical knowledge that is only tacitly recognized (Goldman, 1990, p. 55; Henry, 2010, p. 293). A clinician may be unaware of how he achieves diagnostic closure and decide upon a management course. This is exactly the state of "we can know more than we can tell". All these lead Braude (2009) to conclude that "Polanyi theory of tacit reasoning appears to be in complete accord with Feinstein's theory of clinical reasoning" (p. 195).

Applying Polanyi's concept of tacit knowledge to clinical practice has direct implications for EBM. The clinical evidence in EBM represents a kind of explicit knowledge. But in clinical practice, it is not enough to have this kind of statistical data and rules as their application require the exercise of clinical judgment on their appropriateness in different situations, which in turn hinges on the clinician's tacit knowledge. Polanyi's conception clearly demonstrates the reductionism in EBM's epistemology in downplaying the significance of tacit knowledge in clinical practice and explains the failure of EBM advocates in providing a clear process to incorporate clinical evidence into clinical expertise and patients' preference. Thus, what is lacking in EBM is a language for valuing and externalizing the tacit knowledge residing in clinicians' minds (de Lusignan, Wells, & Singleton, 2002). The approach of KM in recognizing the importance of tacit knowledge held by individuals while acknowledging the need for explicit knowledge in medicine is what is needed in the implementation of EBM and is well suited for correcting its reductionistic medical epistemologies. Thus, Henry (2006) strongly argued that Polanyi's thoughts "provide the framework for an epistemology robust enough to account for medical concepts EBM cannot accommodate" (p. 188). Thornton (2006) appealed to the role of tacit knowledge, or judgment, to unify the tripartite definition of EBM. De Lusignan, Pritchard and Chan (2002) also commented that this was not to decry EBM, but a broader approach was needed in a clinical environment, an approach that "take(s) into account the less formalized forms of knowledge acquired through clinical practice and from working with experienced clinicians" (p. 302).

By encouraging clinical encounter and human interaction, Polanyi's philosophy also lays the groundwork for a truly person-centered theory of medicine (Henry, 2006, 2010). Physicians are told that it is only through face-to-face interaction with patients at the bedside in couple with objective data and clinical reports will they truly understand the patient's illness. This

multiple clinical reasoning model once again acknowledges the realities of daily clinical practice and the art of medicine valued by doctors. It will make the rhetoric of EBM more acceptable to clinicians by embracing both the scientific and craft-based aspects of medical identity (Dopson et al., 2003, p. 322).

1.1.3.2 Knowledge Sharing and Communities of Practice

Knowledge sharing in the form of communities of practice (COP) is another key feature of KM that is essential for the implementation of EBM. As will be reviewed in Chapter Two, COPs are “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott, & Snyder, 2002, p. 4). These COPs are informally bound by common interests and self-organizing in terms of self-selecting members, setting their own agendas and establishing their own leadership. It is very similar to informal networks that exist within an organization or across different companies. They are characterized by a domain of knowledge which creates a common ground to inspire members to contribute and participate; a community of people who creates the social structure that facilitates learning through interactions and relations with others; and the practice which specifies the knowledge the community shares, develops and maintains (Li et al., 2009; Barwick, Peters, & Boydell, 2009, p. 17). Examples include professionals of a discipline such as engineers that work together on similar problems or a network of surgeons that explore novel techniques together. COPs allow active learning to take place and members are free to exchange their individual knowledge with others in creative ways to generate new collective knowledge to improve their own practices, to identify solutions to their problems and to feedback the outcome of solutions to the group for further refinement. Because of this feature, Sandars and Heller (2006) quoted the experience of the National Health Service

(NHS) in UK to demonstrate that COPs are effective means to spread the best practice to improve health service and thus “offer the essential opportunities for evidence (explicit knowledge) to be integrated with individual and collective tacit knowledge, with the result that evidence can be implemented to produce a change in practice” (p. 345). Similarly, Gabbay and le May (2004) were of the view that COPs enable clinicians to acquire tacit knowledge to refine their own “mindlines” that are built on their practical experience to implement research in a local context and to prevent the cookbook medicine from happening. Tolson, Booth and Lowndes (2008) also showed that the Caledonian Development Model effectively promoted evidence-based practice in nursing by facilitating transformational learning, knowledge pooling and translation.

The importance of social interaction and informal dialogue in bridging the gap between research and practice in EBM is highlighted by the success of CHAIN, which was established by NHS as an informal e-mail network for healthcare professionals with an interest in EBM. By sharing knowledge virtually via e-mail messages and enabling members to learn about EBM by observing others from a peripheral position, it illuminates the process whereby knowledge is created, targeted, personalized, and made meaningful through informal social processes (Russell, Greenhalgh, Boynton, & Rigby, 2004). The COPs in Ontario’s children’s mental health sector further illustrated that COP was a promising model for translating knowledge and promoting practice change (Barwick, Peters, & Boydell, 2009). Some more success examples of COPs in the fields of occupational therapy and nursing can be found in Li et al.’s study (2009).

1.1.3.3 Narratives and Storytelling

In the KM epistemology, there is no such thing as an evidence hierarchy. No one kind of evidence is privileged over the others. Instead of clinical research evidence, narratives and stories are promoted as the main sources of unique organizational knowledge and are taking on an increasingly important place in KM. They can be used to distribute uncoded knowledge and tacit problem-solving competences, and generate “thickness descriptions” of contexts, thereby providing in-depth understanding of the complexity of real life situations and transforming explicit knowledge into actionable knowledge (Schreyogg & Geiger, 2006, p. 82). These concepts are gaining rapid momentum in medicine and are found useful to counteract EBM. A new term called “narrative-based medicine” (NBM) was coined to describe these efforts.

Narratives are not new in medicine. But in exploring its relevance to EBM, the attention is turned to patients’ narratives. In the perception of Greenhalgh and Hurwitz (1999), patients’ illness experiences as unfold in stories provide “meaning, context, and perspective for the patient's predicament. It defines how, why, and in what way he or she is ill. The study of narrative offers a possibility of developing an understanding that cannot be arrived at by any other means” (p. 48). Such understanding, they continued, “provides a framework for approaching a patient's problems holistically, as well as revealing diagnostic and therapeutic options” (p. 49). This calls for the art of medicine in the caring of patients, which is not accommodated in EBM as its reliance on empiricism is too general and “macroscopic” to discern the microscopic illness experience of patients (Au, 2002; Urquhart, 1998, p. 426).

Narratives include not only patients’ illness stories but also those derived from medical practice and patient encounters as sources of medical knowledge. Kalitzkus and Matthiessen

(2009) stated that NBM could be understood in the context of patient-centered approaches, incorporating the subjective experience of patients into the objectivity of evidence exemplified in EBM. The patients' illness narratives do not merely describe their pathological causes of illness, but also their own personal experiences in patient-doctor communication. This enables doctors to interpret the illness by integrating the objective diagnostic conditions of the suspected disease with the case specific stories of the patients and their own clinical expertise, the three key elements of EBM (Greenhalgh, 1999). Narratives are regarded as the bridge between the evidence of large-scale RCTs and the medical art of applying the knowledge to a single case. This leads to the initiation of "narrative evidence based medicine" (NEBM), an attempt to integrate both approaches of EBM and NBM and which "recognizes the narrative features of all data and the evidentiary status of all clinical text" (Charon & Wyer, 2008, p. 297). To Goyal et al. (2008), this integration will superimpose the specific onto the general, representing a novel means of improving the quality and outcome of patient care. I will return to this point in detail in Chapter Six as this research shows that narratives and in particular storytelling are proven approaches in organizational sense-making and KM.

In sum, KM addresses many epistemological issues of EBM. Its broad concept of knowledge to include both tacit and explicit knowledge and the recognition that all knowledge has a tacit dimension are well suited for correcting the reductionistic medical epistemologies of EBM, making the rhetoric of EBM more acceptable to clinicians. Knowledge sharing in the form of COPs emphasizes interaction and communication, and social learning (that is reminiscent of much clinical training on placement) that is contrasted markedly with the linear and rationalistic approach of EBM. Patients' narratives provide a framework for approaching a patient's problem holistically. They now become the focus to whom the evidence of large-

scale RCTs can be applied. These areas can be succinctly summarized as relating to knowledge creation, sharing and utilization, the main stages of the KM life cycle. These are the main concern of this research.

1.2 Problem Statement

The above discussion leads to my argument that knowledge creation, sharing and utilization are required to bridge the research-practice gap of EBM. Medicine is an evolving discipline. New diseases, new drugs and new diagnostic methods emerge every day. As the 1956 Dean of Harvard, Dr. Sydney Burwell, put it at a Harvard dinner, “Half of what you are taught as medical students will in 10 years have been shown to be wrong. And the trouble is, none of your teachers knows which half” (Pickering, 1956, p. 115). Acquiring new knowledge to solve everyday clinical problems is essential to the practice of medicine. In fact, knowledge creation is always the first stage in the KM life cycle (Dwivedi, Bali, & Naguib, 2005, p. 144). The 5-step model of EBM also starts with this activity -- formulation of an answerable clinical question relevant to the clinical problem at hand. The fact that there is a question to be asked implies that the past education and experience of clinicians are unable to tackle the patient problem at hand. New knowledge is thus required to close the gap exemplified in the question they raise. But how do they learn new knowledge to solve clinical problems? Where does clinical knowledge come from?

A more important issue is to place this individual level of knowledge creation into the organizational level if KM is to be meaningful. Though it has been argued so far in this research that knowledge is always personal, which follows the theory of Polanyi, knowledge should also be made available to all members of the organization so that they can take advantage of it. This is especially important in healthcare organizations which offer

ultimately a team-based service in the caring of patients by myriads of knowledge-intensive specialists in different fields of specialties; knowledge that remains in the head of a single clinician would not enhance the quality of clinical service of the organization as a whole. Another key question then becomes whether an organization as a whole, through procedures and policies, for example, will learn or only its members will learn.

There are many models and frameworks attempting to explain the process of knowledge creation and sharing in organizations, but none is able to answer the above two questions of how knowledge is created by an individual and shared in the whole organization. The SECI (socialization, externalization, combination, internalization) model of Nonaka (1991), on which many later models are based such as the N-Form Corporation of Hedlund (1994) and the framework of Spender (1996a), is the most representative and influential one. However, as will be discussed in Chapter Two, Nonaka's proposition that organizational knowledge is created through the interaction of tacit and explicit knowledge from individuals to individuals and then to the organization and back to individuals via the four knowledge conversion modes of socialization, externalization, combination and internalization is not conceptually clear to argue why knowledge creation has to begin with socialization and how new tacit knowledge comes to arise in individual heads (Stacey, 2000). Nonaka was also criticized over his conception of knowledge into the rigid tacit and explicit dichotomies (Cecez-Kecmaovic, 2005, p. 57, Snowden, 2002; Gourlay, 2006b), without realizing that any "explicit knowledge must rely on being tacitly understood" (Polanyi, 1969, p. 144). His assumption that all tacit knowledge could be made explicit is also problematic (Gourlay, 2006a, p. 1422) as it was argued that at least some tacit knowledge cannot be made explicit. In the healthcare field, there is a paucity of research on knowledge creation and utilization model; only Evans and Alleyne (2009) provided a KM model that uses a process modeling

approach to understand the processes involved in knowledge construction and dissemination. There is a need to establish more in-depth understanding of the process of knowledge creation and utilization by healthcare professionals.

How one's own knowledge becomes organizational is again unclear despite the conduct of numerous research studies in this area. While many practitioners and scholars in the field of KM and organizational learning are still divided in their understanding of whether an organization will learn; some say yes, some think no and some believe maybe (Antonacopoulou, 2006b), many of them agreed that learning and knowledge creation took place first amongst individuals at one level and the knowledge so created is then spread to group and organization at another higher level (Nonaka, 1991; Kim, 1993; Nonaka & Takeuchi, 1995; Leonard & Strauss, 1997; Sveiby, 1997; Garvin, 1998; Sanchez, 2006; Antonacopoulou, 2006a). But Stacey (2000) argued that through complex adaptive systems, knowledge in an organization emerges in a self-organizing manner in the pattern of interaction simultaneously at the level of individuals and the organization as a whole. There is no question of individuals at one level and the social at another. Both of them are at the same ontological level. This micro-macro debate concerning the link between individual and organizational knowledge is still going on. An examination of this relationship is deemed necessary to understand the nature of organizational knowledge, knowledge creation and utilization, and thus the way KM can enhance the practice of EBM. The aim of this research is to explore knowledge creation, sharing and utilization in healthcare organizations from an ontological approach - from individuals to groups and teams to the organization - and to construct a new KM model based on the empirical findings.

This leads to the following three research questions for this thesis:

1. How are individual and organizational knowledge created in healthcare organizations?
2. How is individual knowledge linked to organizational knowledge for ultimate utilization in healthcare organizations?
3. Can the process of knowledge creation and utilization as derived from the answers to the above two questions be conceptualized in a new KM model?

The answers to Questions 1 and 2 will inform healthcare information professionals how to design products, systems and services to respond to the needs of healthcare professionals and facilitate knowledge creation and utilization in healthcare organizations. The research was conducted in public hospitals in Hong Kong, all under the administration of the Hong Kong Hospital Authority (HA) (Chapter Four). The scenarios in some private hospitals in Hong Kong will also be used for comparison. Though the research is limited to the healthcare setting in Hong Kong, given the universal similarity in the practice of medicine, the answers to Questions 1 and 2 should be applicable to other healthcare settings. The roles of information professionals are examined in Chapter Six.

1.3 Research Framework

In deciding the appropriate research framework for studying the knowledge creation process of individual healthcare professionals, I believe that it should be the one that allows research participants to reveal fully their own perspectives and inner experiences because knowledge creation is a personal and individualistic process. A merely quantitative approach that focuses on hard data that is stripped of healthcare professionals' views is deemed insufficient. A *really* user-centered research framework that enables both qualitative and quantitative analysis will enable healthcare professionals to “freely” speak their real-life experiences and

to dig deeply into different factors that enable or block their knowledge creation, sharing and use in different clinical situations in an undisturbed manner.

In addition, the approach should also meet with my interpretation of the meaning of knowledge. Chapter Two will review the literature on this concept, which is still vague and without a universally accepted definition. In this thesis, knowledge is viewed not only on a personal context but also on a social context in relation to the organization. There are many schools of social theories. I intend not to define knowledge in the cognitive or functionalist perspective. Under this perspective, knowledge is viewed as universal and an objective representation of the world; a stock or a thing awaiting to be discovered and can be encoded, stored and disseminated. This fails to explain the behavior of the social world, which is determined by the meaning individuals attributed to their actions and hence does not lend itself to its reductionist methods. This thesis will take the constructivist or interpretivist perspective, which assumes that “knowledge resides within our bodies and is closely tied to our senses and previous experiences; we will come to construct our knowledge in ways that are unique to ourselves” (Stefanelli, 2004, p. 526). Knowledge is regarded as highly personal, tacit, and socially constructed. It is the result of human action and its creation of meaning.

Dervin’s (1983) Sense-Making Methodology (SMM) is one such theoretical framework that is truly user-centered and takes the interpretivist perspective in its understanding of “knowledge”. Many of its philosophical assumptions, substantive propositions, methodological framings, and methods are found useful to this research. Dervin’s SMM has been developed since 1972 as an approach to studying communication as communication rather than as mere transmission. It conceptualizes messages not as things to be transmitted via channels from senders to receivers but “as constructions that are tied to the specific times,

places, and perspectives of their creators” (Foreman-Wernet, 2003, p. 5). Consequently, communication is a dynamic process aiming at understanding each other’s meaning and that the design of research, system and practices should be based on the realities of how “communicating works for living, breathing, humans who necessarily must act in their worlds as evolving, changing, interpreting agents and not as empty buckets into which right ‘messages’ can be dropped” (Souto, Dervin, & Savolainen, 2008, p. 5). This user-centered approach with focus on a genuine two-way dialogue and communication is what is needed in the practice of KM whose nature is about sharing and dialoguing. In fact, it can be said that the failure of EBM is its underlying transmission principles that ignore the need for communicative communication.

The central mandate of SMM is the study of human sense-making and sense-unmaking in its variant forms as an individual moves through time-space in his / her ongoing life journey. This mandate is exemplified in the Sense-Making metaphor which assumes that there is no objective reality; the reality can be both chaotic and orderly and thus continually evolving. Encountering “discontinuities” or “gappiness” is fundamental in the time-space movement. The metaphor describes the specific moment of sense-making that allows an individual to construct and design his / her movement through time-space. An individual constructs or sees his or her own reality from his / her own “eyes” and is constrained by his / her history, past experience and the perception of the present situation. A new sense must be made and unmade when he or she encounters a “*gappy situation*” which blocks his / her movement in time-space and is compelled to behave appropriately to *bridge* the *gap* in order to move forward. Sources of inputs such as individual’s own ideas, databases, experts, media, etc. will be used to create the new sense and they will be constantly evaluated as helps or hurts when he or she is brought to a new situation with a new gap requiring another gap-bridging

strategy. Sense-making is thus “situational” and anchored in a specific micro-moment of time-space. According to Dervin (1998), new knowledge “is the sense made at a particular point in time-space by someone” (p. 36). In other words, SMM is a methodology to study the creation of meaning from the ambiguous situation an individual faces by making references to the past experience and the current level of knowledge of the individual. New sense will be made when the past experience no longer offers explanations of the present situation, and new knowledge is then created. SMM has been developed as a way to explore information behaviour to help understand how the gaps are bridged or how knowledge is created. Its applicability as an alternative approach to KM practice was also explored by Dervin in 1998 and many other scholars associated with her (Cheuk, 2007; 2008a; 2008b; 2010; Souto, 2007; 2008; 2010). SMM is thus an appropriate approach for examining the knowledge creation process at an individual level.

SMM is guided methodologically by multiple interviewing research methods which conceptualize all the variables in the Sense-Making metaphor. It focuses on the understanding of the micro sense-making and sense-unmaking moment depicted as the intersection of the Situation-Gap-Outcome Triangle in Figure 3.7 in Chapter Three (page 212), which forms the foci of all SMM interviews. SMM interviewing has been developed as an approach to being able to elicit and hear what people “really” want, think, need, feel, experience and struggle with (Dervin, 2008a, p. 14). The Triangle will thus be used to give research participants time to think deeply beyond surface stereotypes about their situations and to share deep articulations (Dervin, Reinhard, Song, & Reed, 2006). From this conceptualization a set of SMM interviewing questions and specific techniques are derived to inform the research design of how the research participants look at their own “situations”, ‘gaps’, “gap-bridging” and “outcomes”. These four elements constitute users-in-situations

moving through time-space. It is one of the basic premises of SMM that these users-in-situations would provide a better predictor of sense-making activities than the traditional across time-space factors such as age, gender and educational level. Thus, these users-in-situations will be the unit of analysis. The Micro-Moment Time-Line Interview is one such interviewing approach of SMM that is adopted in this research to inform data collection as well as analysis. It should be noted that Dervin's SMM offers not just a theoretical framework but also a set of data collection and analysis tools to tap the "situated" sense-making and sense-unmaking moments of research participants. The result of the research based on this truly user-centered approach will assist health information professionals to design information services more responsive to users' needs.

However, SMM has been commented as individual rather than collective understanding. As a result, SMM might seem to be inadequate for explaining group and organizational information communication processes (Tidline, 2005, p. 114). An attempt was made to study the organizational sense-making approaches of Karl Weick and David Snowden. Since there are a lot of parallels as well as differences amongst the theories of these three leading scholars, Chapter Three compares and contrasts their commonalities and differences to derive a more complete theoretical framework to study knowledge creation, sharing and utilizations in healthcare organizations from an ontological approach. It was found that Dervin's SMM is applicable to the study of the relation between micro and macro levels. Weick's approach has certain limitations that it is not deemed appropriate for this research. The Cynefin framework of Snowden is found useful to inform part of the data analysis.

In sum, the objectives of this research are to find out the process of knowledge creation, sharing and utilization in healthcare organizations using sense-making as the theoretical lens.

In other words, the thesis investigates the sense-making activities of healthcare professionals at both micro and macro levels. The findings from the research presented in Chapter Five are analyzed to derive concepts that can be added to or removed from the sense-making model of Dervin and build a new micro-macro sense-making model for knowledge creation, sharing and use. The model forms the basis for developing factors that will facilitate or block sense-making activities. The role of healthcare information professionals is to design user services that will enable the formation of or remove barriers to sense-making in healthcare organizations.

1.4 Significance of the Study

Empirically, the use of sense-making approach as the theoretical framework is a break away from the mainstream thinking which was dominated by systems thinking such as those of Senge, Nonaka and Takeuchi. The Sense-Making Methodology of Dervin has been used in many diverse and seemingly contrasting discourse communities including not only library and information science, but also journalism, media studies, cultural studies, critical theory, education and pedagogy, communication campaign, citizen-government communication, telecommunication policy, health communication and doctor-patient communication. This research is one of the first few to apply SMM in a healthcare setting with participants from doctors and nurses and this is different from other research studies that focus on patients and library users. While Dervin and Snowden have applied their sense-making theories in the study of KM as early as 1998 and Weick writes about organisational sense-making which may or may not be relevant to KM, this doctoral research is amongst the few to compare and contrast these sense-making theories and to derive a more complete micro-macro model for KM. Dervin's approach is used mostly to inform data collection and partly on analysis but attempts is made to explore whether there are links with other theoretical approaches.

The findings that it is the gap-bridging strategies that determine whether knowledge will be created when facing the same knowledge-creating situation is significant to support the claim that gap-bridging is a strong predictor of knowledge creation. EBM is just one of the many gap-bridging strategies that is more likely than others to generate new knowledge; there are myriads of other gap-bridging strategies that will also produce new knowledge for healthcare professionals. This explains why the sole emphasis on EBM in the practice of medicine is not sufficient to handle all clinical situations. The research will also identify the particular situations in which EBM will be employed for decision making. This will be useful to inform healthcare administrators some practical ways to promote EBM in the healthcare setting.

Finally, this research also studies the enablers and blockers of knowledge creation and utilization. This is rarely studied and would be useful to health information professionals in the design of appropriate user services to further facilitate the knowledge creation and utilization process.

1.5 Organization of the Thesis

Chapter Two presents an overview of the current state of research in KM. The conception of knowledge is clarified by revisiting the epistemology of knowledge from the ancient Greek age to the contemporary times, and reviewing the current thinking on its nature in order to arrive at a working definition of knowledge. KM is also re-defined. The chapter also reviews KM practices in the healthcare field and different knowledge creation models. The review of different sense-making approaches is covered in Chapter Three which forms the second part of the literature review. The theories of three leading scholars, Brenda Dervin, Karl Weick and David Snowden are compared and contrasted to provide a theoretical basis

for this research. Chapter Four spells out the research methodology, which largely follows SSM of Dervin. It elaborates the data collection, coding scheme and data analysis method. Chapter Five in Volume 2 reports the results of the research, both quantitatively and qualitatively to answer the three research questions. Chapter Six discusses the findings, the relation between KM and EBM, the role of information professionals in KM based on the micro-macro model of sense-making and the methodology used in this research. This is then followed by a conclusion in Chapter Seven. The interview questions and the code book are provided in the appendices. A consistent citation style of Harvard APA 6th edition citation style is applied.

CHAPTER TWO

LITERATURE REVIEW – KNOWLEDGE MANAGEMENT

There are all kinds of sources of knowledge but none has authority.

Karl Popper

Knowing belongs to the class of achievements that are comprised by all forms of living.

Michael Polanyi

2.1 Nature of Knowledge

The theory of KM is drawn from many different disciplines such as management, organizational behavior, psychology, library science, information systems, communication, philosophy, economics, engineering, etc. (DiMattia & Oder, 1997; Dalkir, 2005, p. 6; Prusak, 2001; Wiig, 2000). There is still no commonly agreed approach in the literature. But central to the understanding of this new theory is the concept of “knowledge”. It has been said that its fluid and elusive nature renders it obscure and unclear to most people. The inclusion of “management” into the phrase only makes the concept more confusing, if not misleading. It is no wonder that they are called an odd couple (Alvesson & Kärreman, 2001) or even an oxymoron (Skyrme, 1997b; 2003). McInerney (2002) summarized the confusion exactly in this statement: “It is this dynamic nature of knowledge that leads to the question of how something in flux, in movement and in action, can be managed” (p. 1011). It is clear that any study of KM should start with the nature of knowledge. To do this, this Chapter will start with an overview of the epistemological origin of knowledge to serve as the background for the discussion of myriads of definitions on the nature and typology of knowledge including personal and organizational knowledge in order to arrive at a working definition for this research. This will be followed by the review of the current state of research on knowledge

creation and utilization with particular reference to the healthcare field to identify gaps in the literature.

2.1.1 Epistemology Revisited

The research on KM has been plagued by the lack of consensus on how to define knowledge. This can be seen in the plethora of definitions of the word in the literature. Table 2.1 provides a snapshot of these various definitions extracted from top KM scholarly publications. These works are selected either because the authors are widely cited in the literature, or listed in the review studies of Nonaka and Peltokorpi (2006), Serenko and Bontis (2004) as well as a number of scholarly publications (Alvesson & Karreman, 2001, p. 997; Firestone & McElroy, 2003, pp. 3-5; Stenmark, 2002; Beckman, 1999, p. 3). The list is not meant to be exhaustive; it just serves to show the degree of emphasis of the word in different contexts and for different purposes. Knowledge is posited as about everything; it is related to truth, beliefs, values, judgment, data, contextual information, insights, meaning, phenomena, know-how, reasoning, experience, procedures, heuristics, objective artifacts, intellectual capital, sentient beings, action, community and society. These definitions are mostly incommensurate with each other. It is therefore hard to understand the true nature of the concept without going back to the discipline, philosophy, which is the most relevant discipline for its study (Wyssusek & Totzke, 2004). Stemming from the Greek word *episteme*, meaning knowledge, and *logos*, meaning theory, epistemology is the branch of philosophy that studies the possibility, limits, origins, structure, methods and validity of knowledge (Delanty & Strydom, 2003, p. 5). In the following section, there is a brief sketch of the philosophical contention since the ancient Greeks to bring out the concerns of KM researchers.

Table 2.1 Definitions of Knowledge Extracted from Top KM Scholarly Publications

Scholarly Works	Definitions of Knowledge
Machlup (1980, p. 58)	All <u>information</u> , in the sense of the contents conveyed, is knowledge, although not all knowledge may properly be called information.
Wiig (1993, p. 73)	Knowledge consists of <u>truths and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how</u> . Knowledge is accumulated, organized, and integrated and held over longer periods to be available to be applied to handle specific situations and problems.
Nonaka and Takeuchi (1995, p. 58)	<ol style="list-style-type: none"> 1. Knowledge, unlike information, is about <u>beliefs and commitment</u>. Knowledge is a function of a particular stance, perspective, or intention 2. Knowledge is about <u>action</u>. It is always knowledge “to some end”. 3. Knowledge, like information, is about <u>meaning</u>. It is <u>context specific</u> and <u>relational</u>. 4. A dynamic human process of justifying personal beliefs toward the truth.
Grant (1996, p. 111)	Knowledge should possess the <u>characteristics of transferability, capacity for aggregation and appropriability</u> .
Spender (1996, p. 57)	Knowledge is conceived as competent <u>goal-oriented activity</u> rather than as abstract “knowledge about”.
Allee (1997b, p. 42)	Knowledge is <u>experience</u> that can be communicated or shared.
Davenport, De Long and Beers (1998, p. 43)	Knowledge is <u>information combined with experience, context, interpretation, and reflection</u> . It is a high-value form of information that is ready to <u>apply to decisions and actions</u> .

Davenport and Prusak (1998, p. 5)	Knowledge is a fluid mix of <u>framed experience, values, contextual information, and expert insight</u> that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.
Shariq (1998, p. 11)	Knowledge is a <u>human activity</u> .
Beckman (1999, p. 3)	Knowledge is <u>reasoning about information and data</u> to actively enable performance, problem-solving, decision-making, learning and teaching.
McDermott (1999, p. 105)	Six characteristics of knowledge distinguish it from information: <ol style="list-style-type: none"> 1. Knowing is a human act 2. Knowledge is the residue of thinking 3. Knowledge is <u>created in the present moment</u> 4. Knowledge <u>belongs to communities</u> 5. Knowledge circulates through communities in many ways 6. New knowledge is created at the boundaries of old
Quigley and Debons (1999, p. 7)	Knowledge is text that <u>answers {how/ why}</u> in the problem space.
Sowa (as cited in Beckman, 1999, p. 3)	Knowledge encompasses the implicit and explicit restrictions placed upon <u>objects (entities)</u> , operations, and relationships along with general and <u>specific heuristics</u> and inference procedures involved in a situation being modeled.
Turban (as cited in Beckman, 1999, p. 3)	Knowledge is <u>information that has been organized and analyzed</u> to make it understandable and applicable to problem solving or

	decision making.
Van de Spek and Spijkervet (1997, p. 36)	Knowledge is the whole set of <u>insights, experiences, and procedures</u> that are considered correct and true and that therefore guide the thoughts, behaviors, and communications of people.
Bennet and Bennet (2000, p. 19)	Knowledge, while <u>made up of data and information</u> , can be thought of as much greater <u>understanding of a situation, relationships, causal phenomena, and the theories and rules</u> (both explicit and implicit) that underlie a given domain or problem.
Stacey (2000)	Knowledge is <u>social acts</u> . Knowledge is continuously reproduced and potentially transformed in processes of <u>interaction</u> between people.
Bell (as cited in Alvesson & Karreman, 2001, p. 997)	Knowledge is defined as that which <u>is objectively known</u> , an <u>intellectual property</u> , attached to a name or a group of names and certified by copyright or some other form of recognition (e.g. publication).
Sveiby (2001b, p. 345)	Knowledge is a <u>capacity to act</u> (which may or may not be conscious) and the capacity can only be shown in action.
Tsoukas and Vladimirou (2001, p. 979)	Knowledge is the individual ability to draw distinctions within a collective <u>domain of action</u> , based on an <u>appreciation of context</u> or theory, or both.
Leonard and Sensiper (2002, p. 485)	Knowledge is <u>information that is relevant, actionable, and based at least partially on experience</u> . Knowledge is a subset of information; it is subjective; it is linked to meaningful behavior; and it has tacit elements born of experience.
McInerney (2002, pp.	Knowledge is the awareness of what one knows through <u>study</u> .

1009-1010)	<u>reasoning, experience or association</u> , or through various other types of <u>learning</u> . Unlike static information that can be held in databases and on paper, knowledge is based <u>in sentient beings</u> , or emanates from them, and thus, it is always changing with the human experience.
Argyris (as cited in Firestone & McElroy, 2003, p. 5)	Knowledge is the capacity for effective <u>action</u> .
James (as cited in Firestone & McElroy, 2003, p. 4)	Knowledge is understanding based on <u>experience</u> .
Choo (2006, p. 132)	Information becomes knowledge when a human actor <u>forms justified, true beliefs</u> about the world (belief structuring).

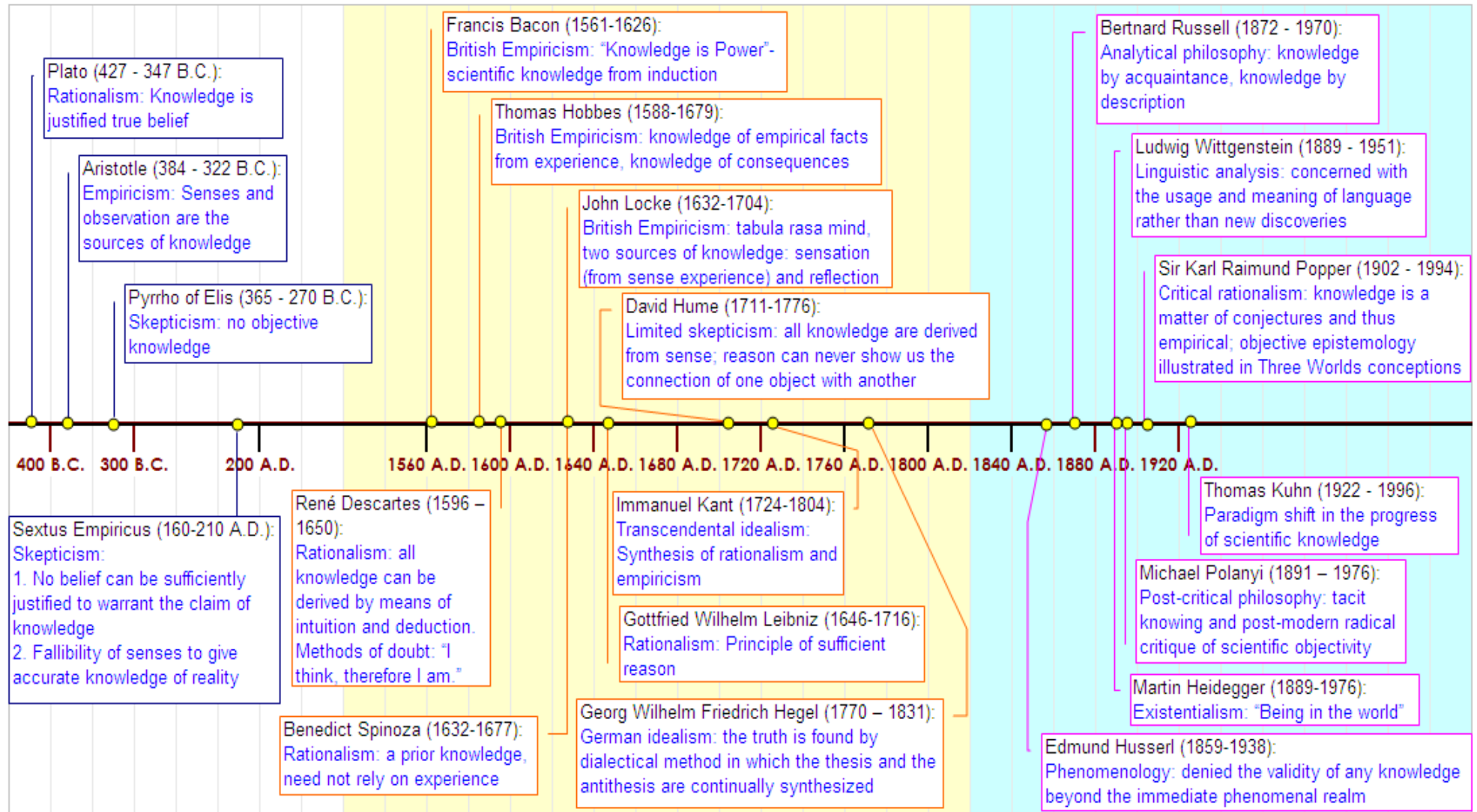
It is generally agreed that epistemological concerns about the nature and sources of knowledge appear to arise first in Plato and has generated intense discussions since then (Aarons, 2008; Kelly, 2004; Kakabadse, Kakabadse, & Kouzmin, 2003; Grant & Grant, 2008; Nonaka & Takeuchi, 1995; Moser, 2010; Pappas, 1998a; Steup, 2010; Stenmark, 2002). A brief sketch of the historical development of epistemology is shown in Figure 2.1. It is largely divided into three main stages: the ancient Greek and Roman age from 300 B.C. to 200 A.D., the Enlightenment and Romantics Age from the 16th to early 19th century, and the contemporary times from the 20th century onwards. This division is modified after Kelly's (2004) and Grant and Grant's (2008, p. 573) works with the purpose of delineating the evolution of the knowledge concept. The suggestions from Drucker (1993, p. 42) who

proposed three phases commencing from before 1700 A.D. to from 1881 onwards, and Allee (1997b, pp. 6-7) who put forward three phases from the Age of Enlightenment to the knowledge era, are not adopted to avoid reflecting the impact of management theories on epistemology and subsequently on KM at this stage. Another purpose of the timeline is to address the omission problem of some essential figures like Karl Popper and Michael Polanyi in Nonaka and Takeuchi's (1995, pp. 22-27) book which covers a detailed recount of the evolution of knowledge from Plato to Ludwig Wittgenstein in the 20th century. According to the explanation of Nonaka and Takeuchi (1995, p. 91), the omission was owing to the relatively minor position of Polanyi in Western philosophy because of his views and background. This brief explanation marked in a footnote in another Chapter of their book is not entirely convincing given the heavy use of Polanyi's tacit knowing concept in their book (Wallace, 2007, p. 31). In fact, they might be too biased on the importance of the Cartesian split in order to contrast it with the unity conception of the Japanese tradition.

2.1.1.1 Ancient Greek and Roman Age

The first definition of knowledge as "justified true belief" is offered by Plato (427 - 347 B.C.) in his *Meno* and *Theaetetus*. He argued that knowledge should be a belief that is both "true" and "justified". It is easy to understand that a false belief can't be knowledge. However, merely a true belief is not knowledge too because it must be justified to remove any chance of lucky guess. But in what way should one justify a true belief? This question of justification is what epistemologists most concerned about and the main area of contention for thousands of years.

Figure 2.1 Timeline of Western Epistemology from Ancient Greek to Contemporary Times



In his *Theaetetus*, Plato further elaborated that knowledge should be a true belief bound by an *aitias logismos*, a reasoned account to affirm that knowledge must be true (Fine, 2003, p. 6). His way of justifying knowledge in pure reason originates also in his metaphysical view which is represented by his theory of “Forms”. Forms can be interpreted as the common property of objects, and they are unchanging and immortal. The physical world is merely the shadowy representation of perfect forms in an ideal world. Using the allegory of the cave, Plato believes that “sense perception is deceitful, likened to the mere shadow of a cutout copy” (Ferré, 1998, p. 38). Thus, Plato does not include sense experience as a source of knowledge. Mathematics is one such discipline that cannot be apprehended by sense. He regards those derive from the sensory experience just mere opinion, not knowledge (Pappas, 1998b, para. 4). Genuine knowledge has its own metaphysical existence, *a priori*, that is innate and inborn to the human mind. It is derived deductively from the immortal essence through pure reason through the method of dialectic.

In contrast to the view of Plato that universal forms can exist independently apart from things, Aristotle (384 – 322 B.C.), the disciple of Plato, believed that universals existed only in particular things. Consequently, the physical world was known to the human mind through perceptual experience, through what was seen and what had been proven. Perception thus provided the starting point of any problem investigation. Subsequently, this would lead to memory, to experience, and eventually to expert understanding (Spellman, 1995, p. 69). In Aristotle’s definition, knowledge is *a posteriori* that is derived inductively from a particular sensory experience and observation of the physical world to grasp the universal characteristics, rather than by intuitive reflection on abstract ideas as Plato claims (Kelly, 2004, p.36). Yet, the operation of sense, memory and experience provides the necessary, but not sufficient, condition for the grasp of a universal that is expressed in concepts and beliefs

(*Posterior Analytics II*, 19; *Metaphysics I*, 1, as cited in Irwin, 2003, para. 2). The quest for full knowledge also requires reasoning and thinking in order to attribute the universal to a particular that we experience (Irwin, 2003, para. 2; Ferré, 1998, p. 45). It can be said that Aristotle's method is both inductive and deductive. As regards justification, Aristotle argued that scientific truth could be justified by means of a series of syllogisms, the first of which was first principles or starting points of investigation. Since first principles were necessarily true and knowable directly, they did not require any demonstration; otherwise, there was the danger of falling into an infinite regress (Pappas, 1998b, para. 5).

Plato and Aristotle's first attempt of inquiry into the nature of knowledge has brought out the difficulties of defining knowledge to certainty. Plato's tripartite definition has been widely accepted until now. But shortly after their death, they were challenged by skepticism. Represented by Pyrrhus of Elis (365 – 270 B.C.) and Sextus Empiricus (160 - 210 A.D.), the skeptics attacked on any claims of knowledge either because of the impossibility of justifying belief or the fallibility of the senses to give an accurate account of the reality. In 1963, Edmund Gettier also called into question the definition by putting forward the famous Gettier problems which showed that there were situations in which a belief may be justified and true; and yet could not be considered to be knowledge (Steup, 2010, The Gettier Problem, para. 1). Being a justified true belief is a necessary but not sufficient condition for the definition of knowledge. No one has yet succeeded in providing another definition of knowledge that will not fall into the trap of the Gettier examples. Skepticism is always a problem for the definition of knowledge. The issue at stake is the trouble of finding the right criterion for knowledge. Plato and Aristotle provide different means of justification. Plato believes in reason for the claims to knowledge while Aristotle argues for sensory experience as well as cognitive thinking. But both fail to prove the infallibility of these sources. Martinich and

Stroll (2010) stated, “how one can know whether there is a reality that exists independently of sense experience, given that sense experience is ultimately the only evidence one has for the existence of anything, and how one can know what anything is really like, given that different kinds of sensory evidence often conflict with each other?” (p. 3). If sensory experience is fallible, why should reason be accepted as infallible? Martinich and Stroll (2010) quoted numerous examples when we would forget, miscalculate or jump too fast to conclusions.

It should be stressed that the tripartite definition refers to what is known as propositional knowledge which means knowing that is the case. It is different from personal knowledge meaning knowing a place or a person, and “knowing how” meaning the practical skill of doing something, which is the concern of KM practitioners (Steup, 2008, para. 1). Nevertheless, it is not well-justified for Aarons (2008) to claim that “traditional philosophical discussions about epistemology are generally limited in their application to KM” (p. 3031). Though Platonic and Aristotelian theories may be imperfect and sometimes problematic (Copleston, 2003, p. 262; Ferré, 1998, p. 23; Kreis, 2009, Aristotle, para. 5), they lay a solid foundation for the subsequent inquiries into central epistemological questions of “What can we know, and how can we know it?” which are important to the understanding of knowledge creation.

2.1.1.2 The Enlightenment and Romantic Age

In the backdrop of the revival of skepticism in the 16th century came the Great Enlightenment. The dramatic success in science and technology brought about an unprecedented optimistic outlook that fostered supreme confidence in the power of reasoning in acquiring absolute and explicit knowledge for human mankind (Mead, 2007, p. 300). This belief in “rational

idealism” coupled with the need to face the skeptical challenge eventually unveiled a new era in epistemological thinking pioneered by the first rationalist philosopher René Descartes.

René Descartes (1596 - 1650) responded to skepticism with his breakthrough thinking that absolute and certain knowledge was possible with a reliable method for seeking truth (Kelly, 2004, p. 112). This was the method of doubt, “a method wherein a proposition is considered false provided there is even the slightest possible ground for doubting it” (Pappas, 1998d, para. 3). He advocated a theory of knowledge that was unfolded in the famous statement – “I think, therefore I am” (*cogito ergo sum*) – which he said was beyond any doubt as no one could question the existence of the thinking self. From the proof of its own existence, Descartes further extends Platonian belief in the separation of mind and body and innate ideas in human mind to the doctrine that only the mind of the thinking self thinks. This mind, endowed with faculties of deduction and intuition, can thus deduce genuine certain knowledge that is justified by *cogito*. In Descartes’ epistemology, only thoughts and reasoning are sources of justification for knowledge. Inductive knowledge from senses, the starting point for knowledge in Aristotelian philosophy, is refuted as knowledge because it is subject to error and confusion. Only those objective primary qualities of physical objects such as mass, length and velocities are counted as items of knowledge as they are not subject to perception. Thus, scientific knowledge has an important place in Descartes’ epistemology.

This Cartesian tradition is considered critical in epistemology in the majority of the literature though it continues the traditional direction of finding the right justification to assure certainty on propositional knowledge in face of skepticism. It has also exerted a far-reaching impact in many disciplines. For instance, scientific studies follow this approach that everything should be measurable (Baets, 2005, p. 31). The idea of divided man – mind and

body – is not only debated in philosophy but also in medicine as can be seen in the concept of “medical model” in which the body is thought as a machine. Clinical medicine also has the problem of reconciling the power of the mind with the workings of the body as reflected in what we call the “placebo effect” (Urquhart, personal communication, December 29, 2005). The deep-seated interest in this problem stimulates growing research in this area (Zubieta & Stohler, 2009; Colloca & Benedetti, 2005) which has found convincing evidence on the impact of placebo effects on changing both perceptions and actual neurobiological processes. It is also believed that future research will shed new light on mind-body interactions.

The dominance of the rationalist thinking of Descartes and his followers Benedict Spinoza (1632 – 1677) and Gottfried Wilhelm Leibniz (1646 – 1716) in the Continent was vehemently challenged by the British empiricists under the leadership of John Locke (1632 – 1704) and his predecessors Francis Bacon (1561 – 1626) and Thomas Hobbes (1588 – 1679). In direct opposition to Descartes’ “innate ideas” as the source of knowledge, Locke argued vigorously that the human mind was a *tabula rasa* at birth, a blank slate, to be filled with experience at a later life. Experience, on which all knowledge was founded, could be acquired not just through sensation from five senses as other empiricists asserted, but also through reflection which was the “nonsensory awareness of the operations of our own minds” to gain ideas of the material world (Ferre, 1998, p. 126). This allowance for both deductive and inductive inferences is another marked difference with Descartes who permits deductive inferences only (Pappas, 1998c, para. 7). Locke defined knowledge as the perception of agreement or disagreement of any of our ideas (Pappas, 1998c, para. 2). Of the three different kinds of knowledge under this definition, intuitive knowledge from perception was regarded by Locke as the most infallible as compared to demonstrative and sensitive knowledge because the mind perceived the agreement or disagreement of two ideas

immediately by themselves. Sensitive knowledge was the most uncertain because it was the knowledge of the existence of external physical objects and belonged to a kind of inferential knowledge. Although Locke argues that people know directly our ideas, not things, he still fails to close the gap between knowledge and the world left by Descartes.

The loophole in empiricism was taken to the extreme by David Hume (1711 – 1776), who put forward the problem of inductive inferences in such a skeptical or radical empiricist's view that it was regarded a reaction to the dogmatism of the followers of Newton at the high time of the Industrial Revolution (Kenny, 2006, p. 154; *Value of knowledge*, n.d., para. 47). Hume inherited the empiricists' tradition of Locke in maintaining that only impressions and ideas gained from perception provided the foundation of knowledge. For propositions expressing relations of ideas such as arithmetic and algebra, he believed that they were intuitively or demonstratively certain as they were derived from the mere operation of thought and did not exist in the universe (*Value of knowledge*, n.d., para. 49). However, for propositions expressing matters of fact such as "bread nourishes us" that was acquired only through experience, he casted doubts on the certainty of knowledge that expressed their causal relations. In Hume's view, senses only observe the sequence of events but not the causal forces of how one event affects the occurrence of another. A classic example is our belief that the sun will rise tomorrow. The belief is based on past observations and no one can know for sure that the sun will rise tomorrow though this has been the case for the past billions of years because of the rotation of the earth. To Hume, the idea of causation derived from inductive reasoning is a kind of habitual thinking or association of past experience that is not grounded with sufficient supporting evidence to prove that things will behave in a regular manner in future.

Hume's extreme empiricism on the uncertainty of the external world aroused much criticism in the decades to follow. He "stabs at the heart of science", whose mission is to build causal laws to ensure what can be expected to happen in future (Ferré, 1998, p. 155). Yet, Hume's theory has practical implications for today's knowledge creation as he reminds us to be cautious of "rational certainty", the problem of relying on past experience to project future occurrences and the acceptance of factual claims without inquiring into the availability of supporting evidence. The rise of EBM can be said to be a response to Hume's idea of the need for evidentiary warrant.

The endless tug of war between rationalism and empiricism for over a century and a half on the unresolved overarching problem of the nature of knowledge was taken to a new level in the 18th century when Immanuel Kant (1724 - 1804) attempted to synthesize both theories in his "transcendental idealism", which was concerned with the method of establishing the conditions for the possibility of knowledge. Such conditions were found in the mixed operation of senses and the mind; the former provided the idea of the representation of objects to the mind, the latter applied to objects conceptual structure available in the mind or what Kant called *a priori* elements which were independent of experience and immortal such as space and time (Kelly, 2004, p. 118; Weber, 1908, Critique of Sensibility, or Transcendental Aesthetic, para. 4). In Kant's words, "Without sensibility no object would be given to us; and without understanding no object would be thought. Thoughts without content are empty; intuitions without concepts are blind" (Buroker, 2006, p. 77). In other words, the mind is not a blank slate as empiricists argue and knowledge is not produced out of cognitive reasoning alone as rationalists believe. The mind with *a priori* provides the necessary condition to transform all the sensory experience into subsequent knowledge. These two theses are what make possible the *synthetic a priori* knowledge, the third category of

knowledge that Kant is most concerned with and that Hume has missed. It refers to knowledge that arises in the mind but can be applied to real objects in the world. Examples are mathematics, physics, metaphysics and all other scientific knowledge such as the proposition “heat expands bodies”. These propositions are synthetic in the sense that they consist of two ideas, one gained from sensation: heat, expansion, bodies, and the other from reasoning: the causal relations between heat and bodies (Weber, 1908, Critique of pure reason, para. 7). They are *a priori* as they are universal and necessary; they are true forever and independent of experience. Kant believes that only this kind of knowledge provides true objective knowledge. He thus successfully rejects Hume’s extreme empiricism and places scientific knowledge in a secure foothold that Hume has attacked as unreliable.

Kant also argued that human knowledge was limited to what was perceived in the phenomenal reality. The mind could not extend understanding to objects not perceivable phenomenally, the *noumena* or what Kant called “things-in-themselves”. By this critical philosophy, Kant has successfully left aside the unknowable world.

By asserting that knowledge is the product of the cooperation between senses and the intellect, Kant has united the conflict between rationalism and empiricism in epistemological phenomenalism: that knowledge is limited to the phenomena. But he never proves the existence of *noumena*. Many of his followers regard his Copernican turn incomplete and there are certain contradictions in his *Critique*, the resolution of which is the motive force of German idealism and leads to the rise of Georg Wilhelm Friedrich Hegel (1770 - 1831) (*Value of Knowledge*, n.d., para. 75), who is one of the first major critics of Kantianism though he also shares many of Kant’s beliefs.

Hegel is both critical of the traditional empiricists' claim to the immediate knowledge from physical objects and the rationalists' *a priori* concept that has been the epistemological emphasis from Descartes to Kant (Rockmore, 2004, p. 131). He is also against Kant's transcendental idealism to dispense with things-in-themselves and demands the unity of transcendentalism and empiricism. Like Kant, he believed that the actual process of knowing started from sense-certainty given by physical objects. Thus, he used the term "phenomenology", meaning the study of "phenomena". From this point onwards, Hegel begins to diverge radically from Kant. He regarded the sense-data as non-knowledge because it was included in consciousness in a non-articulated and disordered way (Limnatis, 2008, p. 191). He devised the theory of dialectical reasoning as the only method for progress in human thoughts and knowledge. In this method, a thesis and its conflicting idea, antithesis, will continually evolve into a higher third view, the synthesis, until the absolute truth or knowledge is achieved. This is best illustrated in his conceptualization of the "Subjective Spirit", the self-knowing human being, which is the synthesis of self-consciousness of the "Concept"- all the thoughts that come to the human mind of an individual - and the "Nature"- all the objects that can be studied by the human mind. In Hegel's theory of knowledge, the process of knowledge starts when the object of "perception" is compared to one's own criterion of knowledge based on prior experience in a historical moment for correspondence. The absence of correspondence leads to a new form of consciousness, the self-consciousness, which will alter both of our knowledge and the object, leading to a higher level of consciousness. This progression from one form of consciousness to another will continue until absolute knowledge is achieved when there is correspondence between the object and the subject and the highest level of reason is reached (Dancy, 1985, p. 230). In Rockmore's (2004) comments, Hegel's claims of knowledge are "justified through their relation to spirit understood as an impure, situated, contextualized, historical form of reason" (p. 133). In this

process, the faculty of reason plays a crucial role as it explains all reality and thus "what is real is rational and what is rational is real". It provides the cognitive source for the interpretation of the meaning of objects (Limnatis, 2008, p. 196). Unlike Kant, Hegel conceives the object and subject as a single entity in which *the object* is at the same time knowledge of *the subject* about the object, each defining itself in others (Limnatis, 2008, p. 193). By the triad of the dialectic reasoning, the Subjective Spirit will evolve into the Objective Spirit and finally the Absolute Spirit which represents a comprehensive world-view encompassing the historical development of civilization in all of its forms.

Though not widely recognized until recently (Rockmore, 2004, 2005, 2006; Westphal, 2003), Hegel is significant in the development of epistemology. He strongly denies if not successfully closes the dualist-monist of subject and object and the rationalist-empiricist gaps (*Value of Knowledge*, n.d., para. 77; Ferré, 1998, p. 169). This also paves the way for the recent wave of anti-Cartesianism. His historical process of knowledge provides an alternative to the ancient Greek philosophy dominated by Platonic realism to address the problem of knowledge (Rockmore, 2004, p. 136). His doctrine of dialectical reasoning is quite controversial. Mueller (1958, p. 413) provided strong evidence to argue that dialectic is not the scheme of thesis, antithesis, and synthesis imputed to Hegel and who had not carried out the method with absolute consistency in all cases. Yet, although Hegel does not use these terms himself, the method does treat skeptical challenge not as a danger to be rebutted, but as a source of discovery, without which there is no progression from one form of consciousness to another (Dancy, 1985, p. 230). Hegel's contribution is also found in the "intersubjective dimension of knowledge and its inherent historicity" (Limnatis, 2008, p. 371). He is the first person to limit knowledge to phenomena situated in time and space by rejecting Kant's representationalism, and, by his criticism on the empiricists' claims to knowledge on mind-

independent objects, turns the claims to know to become contextualized and dependent on prevailing view, attitude, conception and perspective that are subject to change (Rockmore, 2004, p. 134). This absolute idealism has substantial impact on the development of analytical philosophy and the phenomenological movement of the 20th century. In fact, the sense-making approach chosen as the research methodology of this thesis has its origin in phenomenology. This will be delineated in more details in the following section.

2.1.1.3 Contemporary Times

In the 20th century, the age-old problem of defining knowledge was still open to debate. But some significant features of “knowledge” have been emerging that provide some food for thought for contemporary philosophers and also KM researchers:

- Propositional knowledge is still the central concern of epistemologists; there is no other type of knowledge that had been explored. To differentiate between true propositional knowledge and mere belief, epistemologists contend vehemently on the best method of justification.
- There is a possibility for the theory of knowledge. The skeptical challenge to justify knowledge has been used by Hegel as the tool for knowledge discovery.
- Different methods for deriving knowledge are developed:
 - a. Inductive or empirical knowledge gained from one’s senses or experience or *a posteriori*
 - b. Deductive knowledge derived from reason and intuition or *a priori*
 - c. Reflective knowledge gained from introspective attention to the content and workings of one’s own mind
 - d. Transcendental knowledge of conditions
 - e. Phenomenal knowledge from phenomena

- Knowledge can be gained from different sources: perception and observation through senses, experience, introspection or reflection, memory, reason, and phenomena.
- Besides scientific knowledge, knowledge can be situated and contextual.
- Problem of the Cartesian split: the relation between subjective and objective components of the knowledge situation and whether anything will mediate the relation (Delanty & Strydom, 2003, p.5).
- There are both knowable and unknowable worlds, which place limits on knowledge.

There is no one definition and justification to claims to knowledge that encompass these conflicting and sometimes contradictory ideas. The attempts of Kant and Hegel to reduce the epistemological gap cannot command consensus too. Philosophical thinking about knowledge began to shift to other directions in the early 20th century when the upheavals brought about by the two world wars, the rise of Communism in USSR and other European countries, the revolutionary development in physics and mathematics, and the rapid growth of human sciences like psychology and sociology set forth various attempts to overthrow certainties of the old knowledge systems and to explore possibilities of new approaches. Delanty and Strydom (2003, p. 9) pointed out that there were four major epistemic shifts: logical, linguistic, pragmatic, and historical-cultural. Kelly (2004, p. 59) summarized the change as the impossibility of metaphysics and the impossibility of absolute or certain knowledge.

The first shift to the interpretive turn was evident in the rise of “phenomenology” that was founded by Edmund Husserl (1859 - 1938) as a new school of thought that was markedly distinguished from the conceptions of Descartes, Hume, Kant, Hegel and Brentano, all of whom had practiced phenomenology to some degree. Husserl (1913/1967, pp. 114 - 115) understood phenomenology as the science of the essence of consciousness. This is a complex

theory involving psychology, logic, ontology and epistemology. It can be interpreted from three perspectives (Smith, 2007, pp. 187 - 236; 2009). First, it is subjective in nature, studying different forms of conscious experience immediately given in phenomena from the point of view of a first-person. Phenomena “are things as they appear” (J. Smith, 2009, para. 9); they are not limited to sensory experience as Husserl’s predecessors assumed but encompass a much broader range of phenomena including concepts, imagination, desire, thoughts, ideas, volition and so on as we experience things in the world around us. Second, it is inter-subjective when a person is conscious and aware of others’ perception or, put in Husserl’s words, the other is “constituted” in a subject’s empathy. Last but not the least is the objective contents of experience as reflected in the concept of “intentionality” which is the centerpiece idea of phenomenology and is the central structure in the essence of consciousness. An act of consciousness is an experience or a perception that is always directed towards some objects other than itself; be they real or imaginary (Follesdal, 2003, para. 21). Thus, consciousness is always *of* or *about* something. Every act of consciousness, performed by a subject, carries a sense or content that prescribes the various features of an object it intends. What the content prescribes is in turn constrained by a horizon of background of the subject. Intentionality consists in this complex relation among subject, act, content, object and horizon. In sum, phenomenology is essentially concerned with describing structures of intentional conscious experience, mine or others, that is directed towards things in the world and the meaning things have for us in different forms of experience.

Husserl’s theory of knowledge is built upon the above account of phenomenology. In reaction against psychologism and physicalism which ground human knowledge in purely psychological terms and physical sciences, Husserl conceives knowledge as the accumulation of beliefs formed through appropriate acts of judgment in the face of evidence gained by

perceptual observations or other intuitive experience (Smith, 2007, p. 319). In his view, intuition which is the means to gain evidential experience is the sole source of knowledge to the knower. He develops various forms of intuitive experience. The first level begins with sensory perception that grasps the object perceived in its bodily presence. If the intuition is “fulfilled” in this given self-evidence in the sense that the object gets recognized or identified as being (or not being) what was earlier meant or thought (Pietersma, 2000, p. 42), knowledge of the object will be produced. This knowing process is not simply “seeing” how things are, but an act of rational judgment to give meaning to things based on prior concepts and beliefs in support of intuitive evidence. This kind of epistemology is in fact a synthesis of epistemological paradigms of both rationalism and empiricism (Smith, 2007, p. 351). From Husserl’s point of view, knowledge is possible because by the conception of intentionality, the subject or the consciousness and the objects are so interrelated that there is no gap between the knower and the known as had been espoused by Descartes, Locke and Kant in their representational theories of knowledge. Without any presuppositions or unbridgeable gulf in the subject-object relation, intuition is able to provide direct knowledge of objects, without inference from other judgments (Smith, 2007, p. 324). The Cartesian dualism is revised in this new phenomenological ontology that emphasizes the interrelatedness between subjects and objects (Howarth, 1998, para. 1). Kant’s *noumena* are rejected as it is beyond empirical cognition. In addition, knowledge is characterized as situated in character as what motivates a person to seek knowledge is a situation when he is not satisfied with his grasp of an object (Pietersma, 2000, p. 42). These concepts of situated knowledge and sense of fulfillment are all present in Dervin’s SMM, which will be analyzed in Chapter Three.

Husserl further extends intuition from seeing physical objects to having essential insight about essences of truths or concepts such as triangularity and to phenomenological insight

about the essence of consciousness. In his view, sensory perception is certain, but inadequate and nonapodictic. Absolute knowledge can only be attained by turning to transcendental phenomenology through practicing a series of phenomenological “reductions”; the main ones being “*epoché*” and eidetic reduction. By *epoché*, all judgments positing the existence of the objective world and all presuppositions of everyday consciousness are “bracketed off” or “reduced” in a way that would allow for a pure “intuition of essence” (Wolin, 2010, p. 12). By eidetic reduction, the essence is abstracted or discovered in phenomenological reflection and free imagination to reach the transcendental subjectivity and gain intuitive knowledge of essences (Smith, 2007, p. 330; Harrison-Barbet, 2009, para. 23). These reductions enable epistemologists to return really “to the things themselves” and to focus on the realm of phenomena they actually experience (Martinich & Stroll, 2010, p. 43). The implication to epistemology is that when our knowledge depends on our lived experience in the phenomena, the skeptical challenge to the problem of sensation and the necessity of justifying knowledge is undermined (Howarth, 1998, para. 1). On the whole, Husserlian phenomenology will also inform research methodology. Walters (1995) examined its methodological implications on nursing research in four aspects: epistemology versus ontology, issues relating to validity, the involvement of the researcher and aspects relating to interpretation.

Another important concept in Husserl’s epistemology is intersubjectivity, which is the process we come to know other people’s experiences and of cultural objects such as tools, artefacts, institutions and values so as to constitute a common world which we can experience from different perspectives (Smith, 2007, p. 322; Follesda, 2003, para. 56). Husserl is the first philosopher to bring up the importance of empathy, interaction and communication in this process. These concepts are of much relevance in Devin’s SMM and also today’s KM discussion, particularly in knowledge sharing.

Later in the 1930s, Husserl re-conceptualized phenomenology with a shift towards more of the “existential” dimension of human knowledge as a reaction against relativism and irrationalism of his days. This led to the decoupling of natural sciences with the basic knowledge of things in everyday life. He turned to the concept of “lifeworld”, which recognized that all of our knowledge, in various domains including natural sciences like geometry and physics, depended in certain ways on our everyday experience of the surrounding world that was socially, culturally, and historically constituted (Smith, 2007, p. 353). With this theory, Husserl’s epistemology focuses more on consciousness and meaning in context, rather than on pure consciousness of a transcendental ego.

Husserl’s theory of lifeworld became a major source of inspiration for the existentialists, particularly Martin Heidegger (1889 - 1976), whose theory of “being in the world” (*Dasein*) emphasized “a close relationship between knowledge and action” (Nonaka & Takeuchi, 1995, p. 26). Heidegger believed that human’s fundamental relation with the external world was practical rather than cognitive, and they constantly interacted with things of their everyday world. Knowing therefore involved action. J. Smith (2009, para. 23) illustrated the concept with the example that our understanding of the being of toothbrushes was manifested in the capacity of using toothbrushes. This understanding, however, is implicit in the sense that it is difficult for us to articulate it conceptually. According to Heidegger, the tools were just things we used and our knowledge of them was secondary and derivative. He emphasized that in phenomenology, practical knowledge embodied in know *how* was prior to propositional knowledge embodied in know *that* (Howarth, 1998, para. 2). It is the first time in the history of epistemology that knowledge is connected to action and not solely focuses on propositions.

In contrast to phenomenology as a traditional philosophical discipline, analytic philosophy led by English philosophers Bertrand Russell (1872 - 1970) and Ludwig Wittgenstein (1889 - 1951) in the early 20th century marked the logical turn in epistemology as it stressed the use of modern formal logic and unambiguous language in the pursuit of clarity in the treatment of philosophical issues. Russell espoused pluralistic realism in revolt against Kantian and Hegelian idealism and assumed that all human knowledge must begin with sensory experience. But he also believed that “logical principles, whether deductive or inductive, are not known on the basis of evidence from experience and all evidence from experience presupposes logical principles” (Moser, 1997, p. 203). Thus, Russell’s empirical epistemology allows for some kind of *a priori* knowledge. He also applies analytic methods to his epistemology and put forward his famous distinction between *knowledge by acquaintance* and *knowledge by description* and between *knowledge of things* and *knowledge of true propositions* as a method of justification to prove the possibility of knowledge (Moser, 2010, p. 1730). In this method, Russell argues that each questionable entity may be reduced to, or defined in terms of, another entity (or class of entities) whose existence is more certain (Irvine, 2010, para. 20). Sense-data that makes up the appearance of things such as their color, shape, hardness, smoothness and the like was one kind of such certain entity that is known by acquaintance through direct awareness of objects without the intermediary of any process of inference or any knowledge of truths. This is *knowledge of things*. Since sense data constitutes all features of physical objects and that which cannot be known directly because our state of mind is not directly aware of the object but its sense data only, it follows that physical objects can only be known by inferences legitimately drawn from acquaintances. This is *knowledge by description* that requires some *knowledge of true propositions* in order to connect the object with things or its sense data with which we have acquaintance. It is on this basis that Russell (1912, as cited in Chrucky, 1918) wrote, “All our knowledge, both

knowledge of things and knowledge of truths, rests upon acquaintance as its foundation” (para. 4). Here, another kind of non-propositional knowledge - knowledge of things – is put forward after Husserl. The trend of shifting towards practical knowledge is more explicit with Ludwig Wittgenstein’s “activist” theory of knowledge (Shiner, 1977-1978, p. 105) that rests on the activity-based language games and forms of life.

A representative figure in the linguistic stream of analytic philosophy, Ludwig Wittgenstein (1889 – 1951) believed that traditional philosophical problems could be avoided by the appropriate application of ordinary language. No longer upholding his early thinking of the picture theory of meaning and logical atomism as appeared in his first book *Tractatus*, Wittgenstein in later years realized how misleading it was to fix the meaning of a word to the object it names. He came to define the meaning of a word as its use in language and spoke of “language games” to show the countless ways in which language could be applied. Language games were defined as "the whole, consisting of language and the actions into which it is woven" (Wittgenstein, 1953, no. 7). Wittgenstein (1953, no. 23) provided a long list of activities a word might be used in everyday situations such as giving orders, describing the appearance of an object, supplying measurements, reporting an event, and so on. The functioning of this myriad of uses depended on the condition that language games must have social components. It was because if the language was private, another person could not understand it (Wittgenstein, 1953, no. 243). Public language endowed words with meanings found within the social context of a shared relation so that a set of external criteria was available for their correct application. The pragmatic dimension of language games further reflects a specific form of life, which consists of rule-following behavior of participants of the language games. Like games, language has rules and they are formulated by agreement from members of any community to serve their own needs on the basis of their culture,

history, context, etc. The agreement that people learn through their upbringing, education or training is reflected not just in opinions but also in judgments in order for communication to happen. Forms of life become Wittgenstein's ultimate practical "bedrock" which cannot be further explained, validated or grounded (Quirk, 2000, para. 3).

Wittgenstein's epistemology is closely connected to his philosophy of language. He is not intended to give any definition of knowledge. His conception of knowledge is based on neither foundationalism nor coherentism (Shiner, 1977-1978; Bouchard, 2003; Rasmussen, 1974) but is "coupled with that of language-game" (Wittgenstein, 1969, no. 560). Accordingly, knowledge is a kind of activity shown in actions and in what is said (Wittgenstein, 1969, no. 431). Pulido (2009, p. 29) illustrated this with the example of caring of a sick man. A person's knowledge of his sickness is shown in doing things like sitting next to his bed, holding his hand, trying not to aggravate his nerves, checking his temperature, and going out to purchase prescription drugs on his behalf. It is further manifested in what he says: "He may never recover," or "Does he have any last requests?" What we act and we say are essentially determined in a context, a language game. Thus, knowledge is contextualized. In addition, in the private language argument, knowledge is also objective in nature.

With regard to skepticism, Wittgenstein maintains that it belongs to the horizon of knowledge for if there is no doubt, there is no knowledge either. It is impossible to have doubt on *X* until there is some knowledge of *X*. Doubting, however, must be made within the system of language games. It must be based on evidence that something is not following rules. The possibility of errors by future events is not counted as evidence for it only means that the new discovery alters the language games. Along with doubts, there must be something taken for certain, the epistemological yardstick to judge the truth and falsity of propositions. But it

should not be confused that certitude is a 'surer' form of knowledge; it is just "the necessary backdrop against which the language game of knowing, doubting and inquiring take place" (Martinich & Stroll, 2010, p. 45). Wittgenstein regards propositions like "I have hands" or "the earth existed a long time before my birth" as part of the "world picture" that functions like "hinges" or grounds in which truth and falsity can be distinguished and how unfounded doubt can be removed. They themselves are not susceptible to epistemic justification and exempted from doubt; they stand fast for us as common-language users. It is like the bed of a river, which provides the support, the context, in which claims to know various things have meaning but the riverbed itself is not something we can know or doubt. To Wittgenstein (1969, no. 378), knowledge is in the end based on acknowledgement. The acknowledgement is accomplished when the truth of certain empirical propositions renders possible social activities of a community. This statement well concludes Wittgenstein's thought on knowledge: "Giving grounds, however, justifying the evidence, comes to an end; - but the end is not certain propositions' striking us immediately as true, i.e. it is not a kind of *seeing* on our part; it is our *acting*, which lies at the bottom of the language-game" (Wittgenstein, 1969, no. 204).

Although epistemology is not a central tenet in Wittgenstein's philosophy, he has firmly established the close ties between knowledge and action that is in line with the trend in the 20th century. The pragmatists, pioneered by William James (1842 - 1910) and John Dewey (1859 - 1952), took this view further to reject theoretical truth and insist upon practice as *the only* criterion of truth. Dewey defined knowledge as "a process of acting and being acted upon" (Martinich & Stroll, 2010, p. 23). The pragmatic epistemology implicitly assumes that knowledge comes from empirical data on the basis of trial and error complemented with some heuristics or intuition. A contrasting view on knowledge was, however, put forward by

Sir Karl Raimund Popper (1902 - 1994) in the position as a prominent epistemologist though he himself was primarily a philosopher of science. Popper's thoughts were extremely influential in the 20th century. His epistemological works are one of the mostly highly cited and also have direct pertinence to KM (Wallace, 2007, p. 22).

Unlike other phenomenologists, existentialists and positivists, Popper believed that knowledge itself was fallible, not justifiable, therefore it was provisional, hypothetical or conjectural (Corvi, 1993/1997, p. 45). It was objective in nature and would grow in an evolutionary manner. All these conceptions are derived from his non-inductive epistemology and falsifiability principle. The fallacy of inductive reasoning that the future would be like the past has been found to be logically flawed by Hume already. Popper further asserted that inductive logic would further lead to an infinite regress of more inductive reasoning, which would result in another fallacy of begging the question. His epistemology is to do away with induction altogether.

In Popper's view, no scientific theory can be discovered and proved by empirical evidence because no matter how many number of observations can absolutely confirm what one claims to know is the truth, only one counter instance will suffice to disprove it. He is thus strongly against logical positivism as it rests its claim of knowledge on certainty and verification. He argued that knowledge would result only in deductive falsification through a process of "conjecture and refutations" or what Corvi (1993/1997, p. 19) called the method of trial and error. Experiments and observations only test theories, not produce them. Knowledge comes from the generation of tentative hypothesis about the reality from people's imagination and creativity. Only the principle of falsifiability is able to demarcate true hypothesis from false; or good science from pseudo science or non-science. That is, any theory of knowledge will

not be accepted as scientific if it is not constructed in such a way that one can deduce certain consequences from that theory or hypothesis that is falsifiable through testing by experience. He attacked Marxism and Freudian psychoanalysis because both failed to adhere to the principle of falsifiability. The claims to knowledge will be refuted if it fails the test or being falsified. Those that are retained are assumed to be corroborated for further testing and falsification, and it is this most easily falsifiable theory that one should rationally prefer. Accordingly, knowledge can never be proven and verified; we can merely provisionally confirm or refute them. Popper never believes in the classical position that knowledge is justified true belief; instead, he holds the exact opposite view: knowledge is unjustified untrue unbelief (*Critical rationalism*, 2010, para. 6). This new school of thought of Popper is known as critical rationalism. It represents “the first nonjustificational philosophy of criticism in the history of philosophy” (Bartley, 1999, p. 23).

Knowledge is not just fallible but also improvable in Popper’s conception. Termed “evolutionary epistemology”, this alternative approach to epistemology specifies that the growth of knowledge proceeds from our problems and our attempts to solve them. Theories that are proved to be false to solve the problem should be abandoned while those that have eliminated errors of previous theories and thus become more capable to survive all the severe tests will be tentatively accepted as corroborated until “proven to the contrary”. The continuous process of conjectures (tentative theories) and refutation (error elimination) will lead to the emergence of better and improved theories fitter for the problem at hand. They are better knowledge and nearer to the truth than those that have been falsified; they are in the state of “truthlikeness” or “verisimilitude”. But they are not absolute truth. They never are and in fact there is no absolute truth in Popper’s philosophy. Knowledge will grow, evolve and advance only in this modification of earlier knowledge (Corvi, 1993/1997, p. 45) and the

resulting one will come closer and closer to the truth. It is much akin to Darwinism in which only the fittest in certain circumstances can survive. In each selection, species will evolve and develop more adaptive traits equipped to deal with more and more complex problems of survival (*Karl Popper*, 2010, para. 10). Although Popper's philosophy and epistemology are quite controversial, it is undeniable that his emphasis on critical thinking and the avoidance of dogmatism in the study of science contributes substantially to scientific progress. Trial and error, and learning from mistakes are effective ways of creating knowledge too. The theory that knowledge will grow over time is also a convincing argument to share rather than hoard knowledge.

The growth of human knowledge and many of Popper's epistemological ideas are exhibited in his famous Three Worlds cosmology. World 1 is the world of physical objects such as books, computers, rocks and trees. World 2 is the mental or psychological states or processes, or of subjective experiences (Popper, 1978, p. 143). It refers to the subjective realm of thinking, feeling, believing and knowing of an individual (Urquhart, 1998, p. 421; Bawden, 2002, p. 52). When a book, a World 1 object, is read by a person, it will give rise to understanding and feeling of the reader. Two different persons reading the same book will have entirely different subjective World 2 experiences. Thus, World 1 provides the source of knowledge for World 2, which is subjective in nature. It is very similar to Cartesian dualism.

World 3 occupies the central position in Popper's epistemology and "a crucial concept in understanding the growth of knowledge" (Bawden, 2002, p. 52) It is the world of objective contents of thoughts which are abstract objects such as scientific theories, conjectures, problems, critical arguments, languages, stories, myths, tools, ethical values, social institutions, and works of art. Popper's scientific knowledge belongs to this world. In sharp

contrast with World 2 knowledge, World 3 knowledge is entirely objective in nature in the sense that there is no human knower. Knowledge exists in itself and is independent of the individual mind. A document, be it a book or a report “contains objective knowledge regardless of the way in which the document was produced or stored, and regardless of how the document is used or even whether it is ever used” (Wallace, 2007, p. 24). This autonomous nature is of decisive importance for epistemology. World 3 knowledge is the products of the human mind, the linguistic expression of World 2 thought processes. Popper (1978, p. 161) illustrates this with the discovery of prime numbers, which is essentially a human product. Here, one can see the evolution of knowledge from World 1 to World 2 and to World 3. But this is not the end. Once created, World 3 knowledge as expressed in some languages can be shared with others and thus it becomes a possible object of criticism. Knowledge claims or conjectures are now open to falsification, selection, and gradual refinement over time, making them “more useful in both solving problems and in generating new problems that can lead to further progress than beliefs [as a World 2 object] can” (Firestone & McElroy, 2003, p. 9). This is how objective knowledge is created and improved from the subjective thought processes. The agent holding the latter can be an individual, a team or an organization. Thus, personal and organizational knowledge are created in largely the same mechanism. This is the primary concern of KM practitioners.

The evolution continues with the impact of the World 3 knowledge on the changes to the physical World 1. Our minds create World 3 knowledge. But World 3 in its turn will also inform our minds, causing them to think and to understand the reality better. This grasping of the World 3 theory will again lead to human actions in an attempt to effect changes to the physical environment such as the making of atomic bomb as Popper often quotes. World 3 can indirectly exert its causal influence on World 1 but is impossible without World 2 acting

as the intermediary between the two worlds. That is, in Popper's (1978) words, "it is the grasp of the world 3 object which gives world 2 the power to change world 1" (p. 156). Human understanding, and thus the human mind, is indispensable in this process. This is the whole of the evolutionary epistemology of Popper.

Many contemporary philosophers have not embraced Three World cosmology owing to its resemblance to Cartesian dualism. Nevertheless, they are more receptive to World 1 and World 2 knowledge than World 3 (Firestone & McElroy, 2003; Wallace, 2007). As summarized by Bawden (2002, pp. 53-54), the main objections were that World 3 was unnecessary and incomprehensible; that its content could not be related to more familiar physical objects and marginalized human component; and that the interactions between worlds was unclear. Yet the same author found the concept valid in understanding EBM concepts (Bawden, 2002, pp. 54-59). In his interpretation, the burgeoning information products in healthcare such as books, journals, databases, internet sites, e-mails and multimedia materials are World 1. The existence of tacit and personal healthcare knowledge that is required in the practice of EBM and the display of its highly subjective and personal dimension proves the subjectivity of World 2. The great reliance of EBM on the world of objective clinical knowledge in which new knowledge can be discovered, and rejection of justification of clinical practice by reference to authority provides strong validation for the idea of World 3. Urquhart (1998) as well as Bawden (2007) attributed to some extent the philosophical foundation of information science to Three Worlds. On the contrary, Shahar (1997) was not supportive of the validity of EBM concepts. He questioned the scientificity of evidence in EBM from the perspective of Popper's theory of logic and the falsifiability principle.

Popper's Three World ontology has great implications for KM. Hall (2005, p. 172) opined that Popper extended the concepts of knowledge in ways that informed the development of organizational knowledge theory, and brought out the key concepts of whether knowledge was something that could only be held in a person or exist independently from a person. In addition, his World 2 and World 3 are regarded closely akin to the respective tacit and explicit knowledge concepts of his contemporary, Michael Polanyi. While it is natural to make such a comparison, Hall (2005) warned that these two philosophers had opposing foci in their epistemology. The primary emphasis of Popper was on objective or explicit knowledge (World 3) while Polanyi focused on personal knowledge that Popper placed in World 2. Viewing from the nature of scientific discovery and the role of methodology, Richmond (1998) did not regard Popperian and Polanyian ideas as diametrically opposing to each other; on the contrary, they formed complementary theories of scientific knowledge. He argued that Popper was too concerned about what scientists did once they created new ideas while Polanyi was concentrated on how scientists created those new ideas. He thought that the ongoing generation of theories depended on both implicit content of Popper's objective knowledge to discover the hidden problems of explicit theories and Polanyi's tacit dimension to produce solutions to these problems from one's subsidiary awareness. Firestone and McElroy (2003, pp. 21-22) provided a more thorough comparison of their ideas. They pointed out that there was a third category of knowledge, implicit knowledge, which was implicit beliefs that, while not focal or explicit, are expressible given the environmental conditions effective in eliciting them. This three-way classification of knowledge was then compared to Popper's World 2 and World 3. They did not deny that Popper's World 3 was all about explicit knowledge, but the implicit knowledge in the World 3 sense was different from that in World 2. While World 2 was all about tacit knowledge, some World 2 phenomena might represent objects that are implicit knowledge and some are even explicit

beliefs. At the same time, not all explicit statements were about World 3 objects such as the belief in the truth of the quantum theory and not all tacit knowledge was about World 2 such as the subjective knowledge about World 1 or World 3 objects. Wallace (2007, p. 24) refuted the view that Popper's third world consisted entirely of explicit knowledge. In his opinion, "Popper's integrated view of knowledge...suggests that all knowledge is inherently embedded, that either tacit or explicit knowledge can be either embedded or embodied, and that the distinction between embodied and disembodied knowledge is largely immaterial" (Wallace, 2007, p.25).

Now comes to the last but obviously not the least epistemologist of the 20th century, Michael Polanyi (1891 - 1976). Though he turned to philosophy in the late years of his life, Polanyi expounded much more than others on the nature of knowledge and challenged much more than others on modern as well as post-modern understandings of human knowing (Mead, 2007, p. 298). Polanyi's knowledge theory is so influential on KM practitioners that he is the third most frequently cited author in the KM literature (Wallace, 2007, p. 16). His tacit knowledge concept is borrowed most by KM theorists and sets the foundation for much of the theories of KM. Despite his significance in KM, Polanyi was rarely acknowledged in the fields of philosophy and epistemology. Sheppard (1999, para. 1) guessed that it might be due to the failure of Polanyi to give an account of his philosophy of science which was altogether separate from that of his more general philosophical concerns. Or, as Mitchell (2006, p. 19) said, Polanyi's approach might be so beyond the strictures of analytic philosophy that his ideas were largely invisible to British philosophers. To a large extent, the surge in the interests of KM in the late 20th century and subsequently the works of Nonaka and Takeuchi led to the widespread recognition of some ideas of Polanyi. But ironically it is also Nonaka and Takeuchi and many of their followers that misinterpreted Polanyi's original argument. In

this section, Polanyi's model of knowledge will be examined. Nonaka and Takeuchi's KM model will be reviewed in section 2.2 of this Chapter.

What underlies Polanyi's theory of knowledge is his complete rejection of "objectivism", the most prevailing concept in his times. He believed that knowledge was explicitly about truth, but a truth claim did not necessarily lend itself to total clarity and certainty that can be articulated, proved or verified with indisputable method of inquiry. The objectivists' ideal rooted in the Cartesian principle of doubt that had been prominent since the Enlightenment as the guiding principle to knowledge was found to be self-contradictory and thus was unattainable. To Polanyi, objectivism emphasizes so much the quantitative measures that the role played by a knower in a theory of knowledge is largely ignored. It also fails to recognize that, in reality, the truth is only an assertion of what people believe to be a "universal intent" based on trust and faith or what Polanyi terms a "fiduciary framework". In fact, Polanyi is convinced that "scientific discovery, more often than not, required bold commitments of faith and highly creative leaps of the imagination in directions that even the most elaborate methodologies could not anticipate, let alone prescribe" (Mead, 2007, pp. 302-303). It naturally occurs to him that "discovery must be arrived at by the tacit powers of the mind, and its content" and that there are no firm rules to account for the way a good idea is developed for starting an inquiry or verifying and refuting a proposed solution of a problem (Polanyi, 1969b, p. 138). Polanyi called this tacit powers of the mind as tacit knowing which lies at the heart of his "post-critical philosophy" that was developed as an opposition to the prominence of critical philosophy of objectivists.

Polanyi's tacit knowing is based on the part-whole perception model derived from Gestalt psychology which has demonstrated the successful integration of all particulars of a pattern

into a single object whole for instant recognition. Accordingly, Polanyi (1969b) takes as his basic assumption in scientific knowing the ‘trained perception’ of scientists in “discerning gestalten that indicate a true coherence in nature” (p. 138). And fundamental to this tacit apprehension of coherence is two kinds of awareness: focal and subsidiary. They are mutually exclusive as well as mutually dependent in their operations. Focal awareness constitutes the immediate conscious object of people’s attention. This is what Grene calls “knowledge by attending to” (Polanyi, 1969d, p. ix). All focal awareness is impossible without dwelling in subsidiary awareness which lies outside people’s immediate consciousness but, with the help of both subliminal and marginal clues, stands in the background to make attending to the focal target possible (Mitchell, 2006, p. 71). It is for this reason that Grene called subsidiary awareness “knowledge by relying on” (Polanyi, 1969d, p. ix). Tacit knowing is the act of integration of the subsidiary and focal awareness, which works jointly towards the elucidation of a comprehensive entity and contributes to all kinds of understanding (Polanyi, 1969b, p. 140). When a person concentrates his attention focally on the total image of an entity, its particulars tend to become submerged in the whole or become tacit. The entity is seen because its particulars are tacitly or subsidiarily integrated into the coherent image (Polanyi, 1969a, p. 125). A well-known example is the recognition of a human face. All the particular facial features are combined to produce a specific physiognomy. The particulars of the physiognomy are known only subsidiarily and this subsidiary awareness assists a person to focus his attention on the whole face so that it can be recognized immediately. This process of tacit knowing is best summarized in the famous phrase “we can know more than we can tell” (Polanyi, 1966, p. 4). The person who recognizes the human face instantly from a specific physiognomy cannot explain how he knows because the subsidiary awareness of particulars may not suffice to make them identifiable (Polanyi, 1969b, p.142). The same holds true for the performance of many daily

and professional activities. These include acquisition of physical skills like riding a bicycle, playing piano, and learning medical diagnoses; use of tools like a probe for exploring the interior of a hidden cavity; visual perception; the pattern detection skills characteristic of experts; mastery of tests; the utterance of speech; and the use of language (Polanyi, 1962, p. 49; pp. 55-56; 1969a, pp. 123-127; 1969c, pp. 182-183; 1966, pp. 3-7, Gourlay, 2002, p. 9; Mitchell, 2006, pp. 72-74). Polanyi attributes this ability to the heuristic power of the mind in which the process of unconscious trial and error will help the person feel the way to success without specifically knowing how to do it.

Another characteristic of tacit knowing is that the person is “projecting *from* and *through* that multitude of particulars *to* the focal image” he can explicitly recognize (Mead, 2007, p. 306). But he is not merely looking at the object; tacit knowing requires the person to look *from* the proximal term that defines the object *to* a distal term which is its meaning (Wallace, 2007, p. 17). Polanyi describes this tacit knowing as a *from-to* relationship. If the relationship is reversed, that is, the attention is shift from the total image to the particulars of a comprehensive entity, the coherence of the image will be lost. The result is that a pianist is likely to get confused and has to suspend when he becomes conscious of the specific movement of his figures on the keyboard instead of the music he is playing, and a speaker to have “stage-fright” if he just concentrates on the individual word to be told because this attention to the subsidiary particulars “destroys one’s sense of context which alone can smoothly evoke the proper sequence of words, notes, or gestures” (Polanyi, 1962, p. 56).

Polanyi compares the “from-to relationship” to what a person feels between parts of his body and things external to the body and comes up with his view that knowing is an indwelling. As the body is the only thing a person never feels as an object in the process of subsidiary

awareness, the person must dwell in for attending focally to an object that lies outside the body. In other words, we are extending *from* our body *to* outside in order to achieve the act of integration. The body provides the root of the proximal element for merging with the distal element. Thus, in Polanyi's (1966) view, "our body is the ultimate instrument of all our external knowledge, whether intellectual or practical" (p. 15). This indwelling theory directly addresses the problem of Cartesian split between body and mind. Furthermore, the from-to nature of tacit knowing implies the presence of a human knower who exercises his personal judgment to integrate both subsidiary and focal awareness to achieve the target of knowing. The exercise of personal judgment relies essentially on a person's bodily sensation and is thus a skillful performance that "is achieved by the observance of a set of rules which are not known as such to the person following them" (Polanyi, 1962, p. 49). Thus, for Polanyi, all knowing is personal knowing requiring the continued participation of the knower through indwelling. It is neither objective in the sense that it is guided by individual passions nor subjective in the sense that it submits to facts as universally valid. In fact, it transcends the objective-subjective disjunction "by affirming at once both the personal element in all knowing and the objective reality toward which all knowledge strives" (Mitchell, 2006, p. 99).

The above clearly illustrates that in Polanyi's conception, the art of knowing and doing are so inextricably blended together that they cannot be exercised in isolation. Hence, knowledge is defined as "an activity which would be better described as a process of knowing" (Polanyi, 1969a, p. 132). In fact, Polanyi speaks much more of knowing than the common term "knowledge". Gourlay (2002, p. 8) counted that he used "tacit knowing" approximately five times more than "tacit knowledge" in his books *Knowing and Being* and *The Tacit Dimension*. What Polanyi (1966) understands from Gestalt psychology about knowledge is that it is not a result of a passive process of integrating the subsidiary awareness with the focal awareness,

but “the outcome of an active shaping of experience performed in the pursuit of knowledge” (p. 7). This process view of tacit knowledge means that it covers both practical and theoretical knowledge; or what Gilbert Ryle (1900 – 1976) calls the “knowing how” and “knowing what” (Polanyi, 1966, p. 7). Both of these two aspects of knowing share a similar structure of knowing - tacit integration or active shaping of experience - that comes from “the tacit power by which all knowledge is discovered” (Polanyi, 1966, p. 6).

At the heart of Polanyi’s knowledge theory, all knowledge falls into two classes, it is “either tacit or rooted in tacit knowledge” (Polanyi, 1969c, p. 195), and thus our knowledge may “include far more than we can tell” (Polanyi, 1969a, p. 133). The knowledge that is “capable of being clearly stated” (Polanyi, 1966, p. 22) is termed “explicit knowledge” while the knowledge that “cannot be explicitly stated” (Polanyi, 1969b, p. 141) is known as “tacit knowledge”. This criterion of articulation used by Polanyi is taken superficially by many KM theorists as the only means to distinguish between tacit and explicit knowledge. They fail to recognize their intricate relations that Polanyi (1969a) described in this statement:

We have seen tacit knowledge to comprise two kinds of awareness, subsidiary awareness and focal awareness. Now we see tacit knowledge opposed to explicit knowledge, but these two are not sharply divided. While tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. Hence all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable. (p. 144)

Polanyi has never laid down an exact definition of “explicit knowledge”; again Gourlay (2002, p. 10) found that he only occasionally mentioned the term in *Knowing and Being* and *The Tacit Dimension*. From these works, explicit knowledge can be referred to as a communication, specifically a letter, all spoken words, all formulae, all maps and graphs that

are arrived at by explicit inference (Polanyi, 1969c, pp. 144 - 145). Similarly, Grene (Polanyi, 1969d) conceptualized explicit knowledge as “crystallized in the formalisms of words, pictures, formulae, or other articulate devices” (p. xv). Yet, the meaning behind these objects is still tacit. In fact, tacit knowledge will act as the background to make possible the explicit dimension of human knowledge. It is erroneous for most contemporary KM theorists to take the view that tacit knowledge and explicit knowledge are dichotomous. Decisions can be made at an explicit level, but to Polanyi (1966, p. 21), the ideal of a strictly explicit knowledge that would eliminate all tacit knowing is indeed self-contradictory and logically unsound. Tacit knowing is fundamental to all kinds of knowledge; it “creates explicit knowing, lends meaning to it and controls its uses” (Polanyi, 1969b, p. 156). Hence, explicit knowledge is rooted in tacit knowledge. Without the tacit dimension of “what we cannot tell”, the explicit knowledge of “what we can tell” is strictly meaningless. Since explicit knowledge and tacit knowledge cannot be sharply divided, they are not something amenable to conversion as in Nonaka and Takeuchi’s SECI model. Yet, they can be transferred and some tacit knowledge can also be made more explicit through language and dialogue. Polanyi’s tacit and explicit knowledge as spelt out in his *Personal Knowledge* (pp. 87-101) can be conceptualized in Figure 2.2 that is drawn by Grant (2007, p. 177).

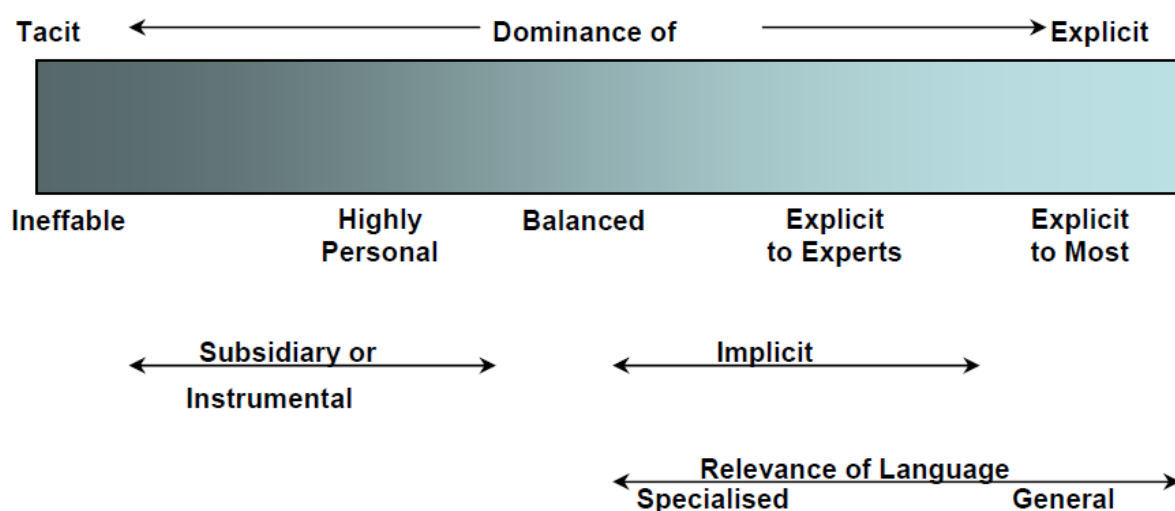


Figure 2.2 Polanyi’s Concept of Tacit and Explicit Knowledge (Grant, 2007, p.177)

It is unfortunate that the intricate relationship between tacit and explicit knowledge has largely been lost when they are applied to the domains of KM and other related fields (Wallace, 2007, p. 18). Such misunderstanding can be seen from the following long list of commonly perceived characteristics of tacit knowledge that were synthesized by Crowley (as cited in Wallace, 2007, p.19):

- Personal in origin
- Valuable to the possessor
- Job specific
- Difficult to fully articulate
- Both known in part and unknown in part to the possessor
- Transmitted, where transmission is possible, through interpersonal contact
- Operative on an organizational level
- Applied, in part, through “if-then” rules
- Capable of becoming explicit knowledge and vice versa
- Intertwined with explicit knowledge along unstable knowledge borders
- Poorly reflected in contemporary knowledge literature

Wallace (2007, pp. 19 - 21) found that most of the above characteristics were not supported by Polanyi’s works and those that could be supported were through inference only. He provided lots of counter arguments to many of these common misconceptions and attacked that some were difficult to interpret such as “tacit knowledge is both known in part and unknown in part to the possessor”, “tacit knowledge is intertwined with explicit knowledge along unstable knowledge borders” and “tacit knowledge is applied in part through ‘if-then’ rules”. He only admitted that tacit knowledge was context-specific but this was essentially trivial and that it was capable of becoming explicit knowledge but questionable on the reverse.

An outgrowth of Polanyi's tacit knowing is his concept of scientific discovery. It is often claimed that Polanyi's ideas have many parallels with Wittgenstein's theory including the recognition of the importance of tacit knowledge and its root in bodily activities, the stress on indwelling and the view on the question of skepticism (Gill, 1974, pp. 286 - 288; Gourlay, 2000, p. 8; Gourlay, 2002, p. 8). From my point of view, there are even more parallels with the theory of Dervin. First, Dervin's emphasis on "verbing" is similar to Polanyi's talk of tacit knowing. Second, Polanyi's ideas of problem-solving and the corresponding scientific discovery also share many similarities with Dervin's SMM. These two models are mapped in Figure 2.3 below to reveal their parallels.

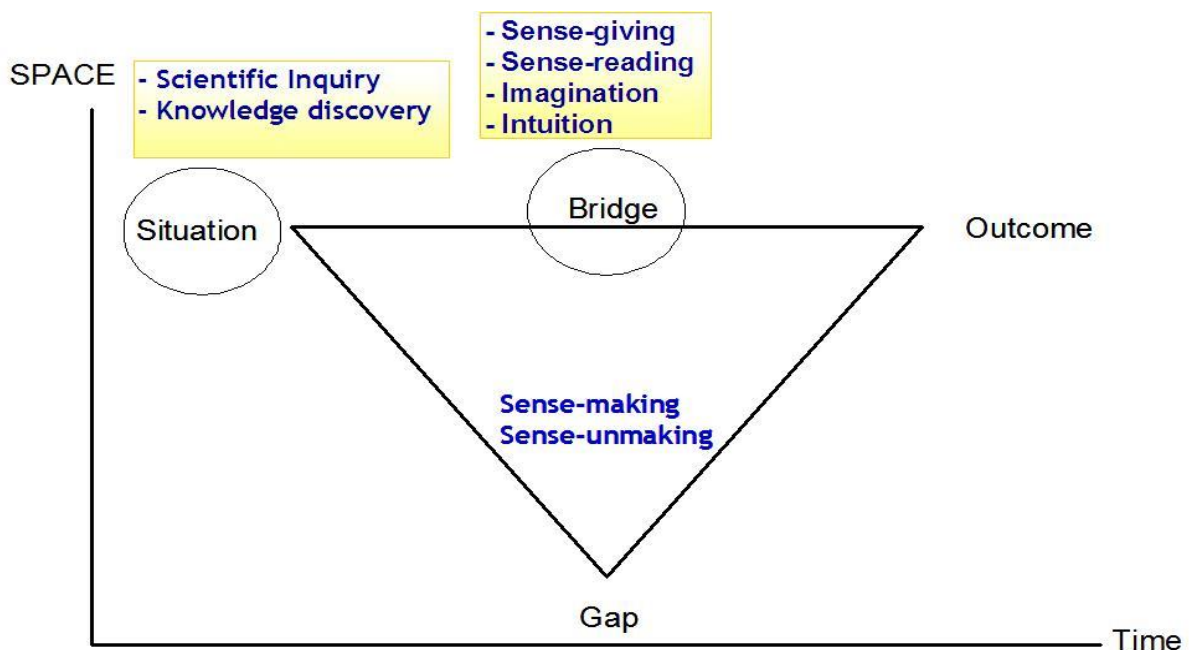


Figure 2.3 Putting Polanyi's Concept of Scientific Discovery in the Perspective of Dervin's Sense-Making Triangle

Polanyi named the method of discovery as sense giving and sense reading. The terms so picked closely resemble that of "sense-making" and "sense-unmaking" adopted by Dervin. Polanyi (1969a, p.133) believed that what accounts for tacit knowing was the presence of an external reality with which people could establish contact and all true understanding was an

intimation of such a reality. This means that tacit knowledge is something awaiting to be discovered, the process of which is unspecifiable. Polanyi (1969b, p. 143) termed this process as “discovery without awareness”. Discovery takes place in four separate stages: preparation, incubation, illumination, and verification (Polanyi, 1962, p. 121).

The first stage is the appreciation of a problematic situation. Polanyi thinks that to see a problem is to see something hidden. Whether a true problem is seen depends on how well the coherence of the hitherto uncomprehend particulars are intimated (Polanyi, 1966, p. 21). In Dervin’s SMM, the person is facing a gappy situation that blocks his movement in time-space so that he needs to construct a new “reality” by taking into consideration all the constraints facing him. The second stage of incubation takes the person to have “a deepened sense of the nature of things and an awareness of the facts that might serve as clues to a suspected coherence in nature” (Polanyi, 1969b, p. 143). At the same time, this is also a more relaxed period by not attending to the problem directly in the hope that through the work of the subconscious some new ideas may emerge. A feasible solution will then be conceived in the third stage of illumination to cross the “logical gap” between the particulars of a problem and its solution. It is like bridging the gap in Dervin’s SMM. But for Polanyi, the strategy available to the knower is purely his own “intuition” or “foreknowledge”. Intuition is “a skill for guessing with a reasonable chance of guessing right; a skill guided by an innate sensibility to coherence, improved by schooling” (Polanyi, 1997, 257). It gives a person a deepening sense of coherence, which will tell him / her unconsciously where to go and where to stop. Although this method does not guarantee correctly all the time, Polanyi (1997) felt that “a method for guessing 10% above average chance on roulette would be worth millions” (p. 258), and thus it is “different from the supreme immediate knowledge called intuition by Leibniz or Spinoza or Husserl” (pp. 257 - 258). This intuition works with imagination as

well. Once the problem is identified, it is the imaginative power of a knower that will be thrust forward to search for clues either by speculation or experimentation. It is then integrated by intuition into new surmises to get the problem solved. Intuition thus stands for a series of integrative acts that will take place at any stage of scientific inquiry (Polanyi, 1969c, p. 201). The dynamics of tacit knowing is kept moving by this combination of intuition and imagination. In Dervin's SMM, a lot more strategies can be applied to "bridge" the gap through sense-making and unmaking; imagination and intuition are just two of them. Finally, the possible solution will be subjected to verification, which is accomplished by a random trial and error until a proven solution is found. At this stage, the person will be endowed with new discoveries and insights, like gaining a foothold at another shore of reality (Polanyi, 1962, p.123). This is the outcome or uses in Dervin's sense-making triangle.

Polanyi likens the whole process of knowledge discovery to the sequential work of sense-giving and sense-reading. Sense-giving is to integrate and endow with meaning things of which we possess only subsidiary awareness while sense-reading is involved in tacit semantic acts (Polanyi, 1969c, p.184, 187). We make sense of a problem through sense-reading to obtain clues to understand the problem and the clues are endowed with meaning by integrating them into a possible whole with the help of our imagination and intuition in order to give sense to the problem so that some feasible solutions will come up in the final stage of sense-reading. Our past experience and education will help understand familiar experience and absorb new situations. The close resemblance of ideas between Polanyi and Dervin provides another justification for the adoption of Dervin's SMM as the research framework of this study.

The above method of knowledge discovery is closely associated with Polanyi's view of the external reality, which resolves the long-standing *Meno's* paradox of Plato. To Polanyi, the reality is full of infinite richness, which will produce unexpected manifestations of which people have just tacit foreknowledge. We are able to recognize a hidden problem because of the appreciation of this indeterminate reality with unthinkable consequences. The fact that there is undisclosed future and intuition is a skill that is liable to errors means that "knowing is both fallible and colored by personal experiences" (Mitchell, 2006, p. 85).

Other Polanyian concepts that are relevant to KM are the method of acquiring and sharing knowledge. Polanyi pointed out that subception or implicit learning is the principal mechanism by which tacit knowledge is acquired. The psychological experiment of Lazarus and McCleary in 1949 and that of Eriksen and Kuethe in 1958 were used to illustrate that a person could anticipate an electric shock at the sight of the "shock syllables" or forestall the shock by avoiding the utterances of "shock words" without knowing how he learnt such knowledge (Polanyi, 1966, pp. 7 - 8). Implicit in this "learning without awareness" is the need to acquire knowledge through apprenticeship and practice. Polanyi (1962) stated,

By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another. A society which wants to preserve a fund of personal knowledge must submit to tradition. (p. 53)

In asking people to submit to the authority of a master, Polanyi confirms the importance for a student to indwell in a practice he does not understand at first but will gradually progress to clarity until he learns the trick as to what his master did. It is much like learning

connoisseurship, which can only be communicated by example, not by precept. Another implication is that if learning a skill requires imitating what others are practicing, it must have a tradition to be transmitted to and the willingness of the people belonging to that tradition to pass it on to others. Here lies the importance of knowledge sharing and the underlying need for articulate communication. Thus, for Polanyi, “knowing is not merely social; it is communal, for traditions persist only in communities that embrace, whether tacitly or explicitly, a particular tradition as an orthodoxy” (Mitchell, 2006, p. 68). This concept also paves the way for the development of COP as one of the most popular tools of KM.

Polanyi exerts a profound impact on the KM movement. Grant and Grant (2008) commented, “In many ways, Polanyi can be seen as a bridge between the philosophical works on knowledge and the beginnings of an approach to the explicit role and use of knowledge in business communities” (pp. 573-574). He is the first person to put forward in an explicit manner several important concepts relating to the nature of knowledge. Echoing the thoughts of Ryle, Polanyi argued for the epistemological relevance of both theoretical and practical knowledge using the example of the act of balance involved in riding a bicycle. He also followed the line of thoughts of some of his preceding epistemologists to associate knowledge with action and defined knowledge as a knowing process shaped by personal experience, which was rich in tacitness that could not be articulated in most of the time. His theory on “tacit knowledge” forms an indispensable foundation for the understanding of clinical reasoning and the implementation of EBM, as has been clarified in Chapter One.

Following Polanyi is Timothy Williamson (1955 -) who not only acknowledges that a person is not in a position to know whether he knows something, but also takes a step further to study the relationship between evidence and knowledge. He argues that one’s total evidence

is simply the totality of what one knows (E=K thesis) and subsequently develops a related theory of evidential probability in which the evidential probability of a hypothesis for a subject is its probability conditional on the subject's knowledge (T. Williamson, 2010, p. 201). This means that one should proportion one's belief in a proposition to the support it receives from one's knowledge (Williamson, 2000, p. 188). This approach is a form of objective Bayesianism, which holds that appropriate degrees of belief are largely, though not entirely, determined by the subject's evidence (J. Williamson, 2010). Since one does not always know what one knows, updating on new evidence because of error in prior knowledge permits propositions to gain as well as to lose probability, and this will not affect the E=K thesis. Under this model, evidence plays the role of falsification and Bayesian confirmation of hypothesis. Williamson also uses formal semantic theories of natural languages to argue against Ryle that all knowing-how is knowing-that instead of knowing-how being a species of knowing-that (Stanley & Williamson, 2001).

Two features of Williamson's epistemology are relevant to the implementation of EBM. First, the total evidence requirement points directly to the weakness of EBM to equate evidence solely with scientific knowledge and the increasing need for it to broaden its base of evidence. Second, the practice of EBM requires making rational decisions amongst a set of possible actions associated with a set of possible consequences. The Bayesian principles are able to provide a logical and quantitative approach to make sense of the uncertainty and probabilities in decision-making.

To continue the trend of recognizing that knowledge is social and communal, social epistemology emerged in the latter half of the 20th century as an approach to epistemology that examines the social and interpersonal dimensions of knowledge in contrast to the

individualistic flavor of traditional epistemology (Goldman, 2010, p. 82). Its origin can be traced back to Thomas Kuhn's (1922 – 1996) groundbreaking works *The Structure of Scientific Revolutions* in which his account of normal and revolutionary science provides myriads of influential examples of a social analysis of science. It has been claimed that Kuhn found much of his insights from the social construction component in Polanyi's tacit knowing and his works on problem solving (Henry, 2010, p. 294).

There is as yet little consensus on the method of investigation of social epistemology, resulting in different trajectories in the field. The more classical approach can be regarded as an extension of the traditional epistemology and thus it aims at studying the role of social processes in determining whether a person has justified belief (Goldman, 2010, para. 8). Another version of the classical approach calls for studying the circumstances a person is justified in accepting the statement and opinions of others, and the nature of collective knowledge. The radical approach rejects objective norms of rationality and holds that a new socialized successor is needed. It does not accept that scientific facts are out there to be discovered, and insists that knowledge must be socially constructed or created. This view is later developed into "social constructivism", or "constructionism", which proposes new definitions for knowledge to form a new paradigm, based on inter-subjectivity instead of the classical objectivity, and on viability instead of truth. Representing the weaker stream, Steve Fuller (1959 -) is interested in understanding what beliefs are "institutionalized" in this or that community. He seeks to identify the social forces and influences responsible for knowledge production such as universities. The new conception of knowledge brought about by the social epistemologists brings new awareness to KM practitioners that knowledge can be a social product and their attention is also shifted to the collective forces in organizations

and the process by which people are engaged for knowledge creation and sharing in organizations.

To conclude, it is clear from this historical overview of the epistemology that it is impossible to arrive at a single unified definition of knowledge. There was controversy between rationalists and empiricists; disagreement between foundationalists and coherentists; and argument between internalists and externalists. In the 20th century, epistemology ran into several lines of development. The political, social and economic upheaval of the time and the dramatic growth of social science all brought new thoughts and directions to epistemologists. The phenomenologists, existentialists, positivists, analytical philosophers, pragmatists and philosophers of science all have attempted to explore in-depth the stone-age problem of what knowledge is. Indeed, many present-day conceptions of knowledge could attribute their origins to this long tradition of exploration. Below is a summary of the philosophical concerns in relation to KM:

1. Plato's justified-true-belief definition of knowledge still holds much value in the hearts of most epistemologists. Even now, most agree that knowledge is based on belief and faith, though they vary on the method of justification. There is growing recognition amongst contemporary epistemologists that knowledge involves action and language.
2. Apart from propositional knowledge, there are many other types of knowledge including tacit versus implicit versus explicit; theoretical versus practical; know-how versus know-what (know-that); knowledge by acquaintance versus knowledge by description; personal versus organizational. This represents reconciliation between natural and human sciences.
3. Knowledge involves a relation between the subject and the world, the knower and the known. It has both a subjective and an objective side. It has long been believed that there is an objective reality out there. But the role of the knower is increasingly emphasized

leading to personal knowledge and finally social constructivism that regards knowledge to be socially constructed.

4. Besides objectivity and subjectivity, knowledge is also thought to be situational, fallible, provisional, conjectural, changing and relative. It must be verified and falsified and it grows in an evolutionary manner.
5. More sources of knowledge are examined. In addition to perception, observation, introspection, empirical evidence, reason, memory and lived experience in the phenomena, there is knowledge discovery associated with problem-solving using intuition, imagination, insight, and trial and error as some indispensable strategies. Knowledge can also be acquired through apprenticeship and practice.
6. Although Polanyi led the way to the process of knowing, the developments in neuroscience such as brain imaging and the analysis of the placebo effect and later artificial intelligence in the 1950s that conceived the nervous system as a logical structure and the cognitive system as a machine for information processing probably lend more weight to the process of knowing and what is involved in that than on knowledge itself. They also exert a strong influence on organizational behavior.
7. Knowledge is increasingly inter-subjective and socially contextualized; communication is essential in the process.

The historical account of epistemology alone cannot provide a firm foundation for the theoretical development of the conception of knowledge without understanding how knowledge is conceptualized in the contemporary KM literature. As can be seen in Table 2.1 on pp. 36 – 37 above, there are fragmented as well as divergent views on the nature of knowledge. In the following section, the current perspectives on knowledge and the respective approaches to KM in organizations will be examined using a paradigmatic

approach. The review will focus primarily on the underlying assumptions and characteristics of each perspective and their impact on how knowledge is managed. Finally, a working definition of knowledge for this study will be mapped out in the last section.

2.1.2 Current Studies on the Nature of Knowledge and Approaches of KM

The current studies on the concept of knowledge evolve around its heterogeneous and multi-dimensional nature. From the above epistemology review, knowledge can be personal, tacit, sticky, lumpy, leaky, codified, embedded, embodied, contextual, capital, competency and informate (Shariq, 1998, p.11). It can also be subjective, objective or inter-subjective. Sometimes, it denotes an entity of justified true belief; sometimes, it refers to a process of knowing that underlies the need for action and language. Besides its epistemological level, knowledge can be viewed from an ontological perspective. It can reside in a person's mind while at the same time get nurtured in community or social groupings, though in the realm of KM, the primary concern is on organizational knowledge than individual knowledge. In view of these myriads of understandings, various attempts had been made to establish an integrated framework to organize the literature for more in-depth study.

One attempt takes a historical approach to divide the development of the concept of knowledge and KM approaches into different generations. There are Koenig and Neveroski's (2010) four-stage view of KM, Snowden's (2007) third generation KM, Firestone and McElroy's (2002) Second Generation Knowledge Management and Grant and Grant's (2008) composite model of next generation KM that is derived from theories of these scholars as well as those of Sveiby and Wiig. Knowledge was defined differently in these different historical stages. Arguably, this generation framework provides a clear timeline for the understanding of the concept of knowledge and the approaches of KM. However, there is no

consensus in the literature on the exact commencement of the KM movement. Underlying the historical framework is an implicit assumption that the concept and the subsequent approaches of managing knowledge can be so easily identifiable in each of these generations that the evolution of KM can be neatly chopped up into different periods of time. This is hardly sustainable given the fact that there is no truly one form of knowledge at any given time (Spender, 1998b, p. 236). On the contrary, many competing perspectives and schools of thoughts may coexist simultaneously.

Hazlett, McAdam and Gallagher (2005, p. 33) strongly favor undertaking a paradigmatic analysis to understand the myriad of perspectives associated with knowledge, generate a viable integrated interdisciplinary research directions and provide a basis for comparative analysis. The term “paradigm” means a general perspective or way of thinking that reflects fundamental beliefs and assumptions about the nature of phenomena (Kuhn, 1967, as cited in Gioia & Pitre, 1990, p. 585). Apparently, a paradigmatic analysis that offers a generic approach to reveal the underlying assumptions and characteristics of knowledge is more compatible with the purpose of this research. Furthermore, I also support the view of Gioia and Pitre (1990) that “theory building, and knowledge are essentially epistemic, in other words, they are paradigm-based” (p. 587). Hence, the seemingly disparate perspectives on knowledge will be mapped into appropriate research paradigms for analysis.

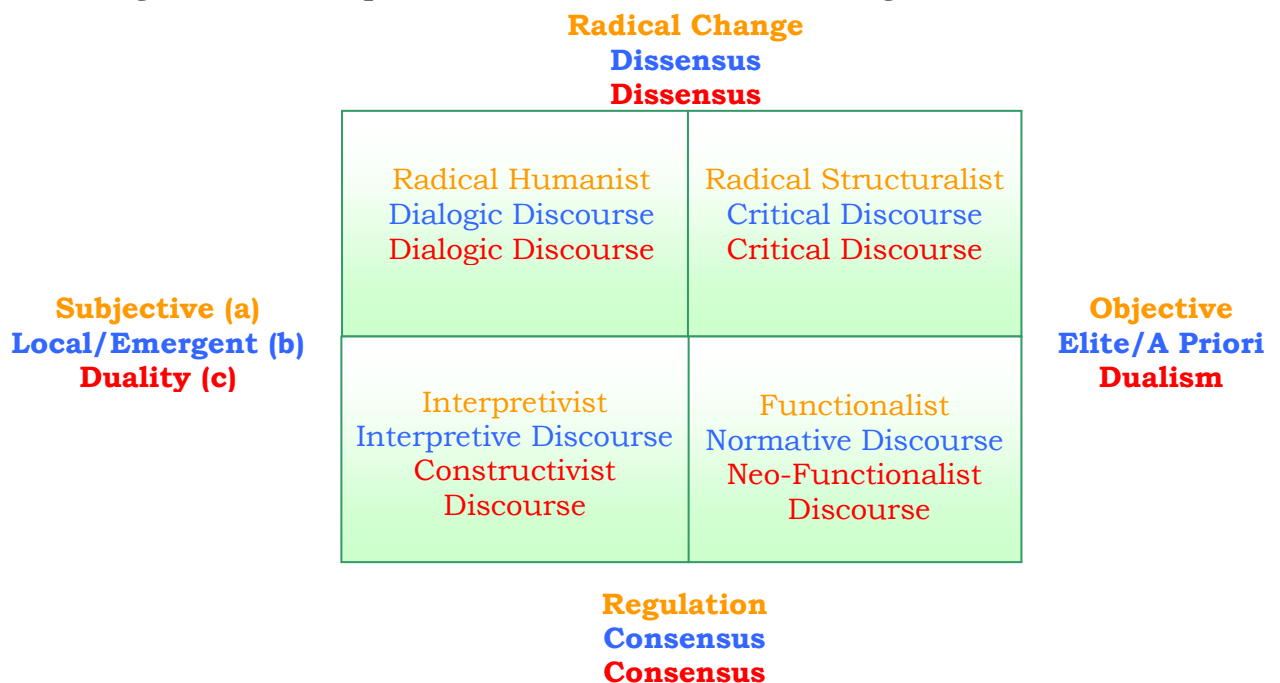
Various categorizations of research paradigms were reported in the literature (Burrell & Morgan, 1979; Schultze & Stabell, 2004; Hazlett, McAdam, & Gallagher, 2005; Guo & Sheffield, 2008; Hislop, 2009). The first is Burrell and Morgan’s (1979) four-paradigm scheme comprising functionalist, interpretivist, radical structuralist, and radical humanist paradigms for social and organizational inquiry. These paradigms are organized along the

subjective-objective and regulation-radical change dimensions. In adaptation of this model, Deetz (1996) adopted the dimensions of “origin of concepts and problems” (local/emergent versus elite/a priori) and “relation to dominant social discourse” (dissensus versus consensus) to classify research in organization science into four discourses instead of paradigms, namely, normative, interpretive, dialogic, and critical. This discourse framework was later taken up by Schultze and Leidner (2002) to study knowledge and KM in information systems research. In recognition of the weakness of applying the dimension of local/emergent versus elite/a priori to the study of KM, Schultze and Stabell (2004) introduced a new epistemology dimension of duality-dualism continuum and, in order to highlight that the epistemology dimension was different from that of the previous, relabeled Burrell and Morgan’s functionalist and interpretivist paradigms into neo-functionalist and constructivist discourses respectively while retaining the Deetz’s labels for the remaining two. This becomes a new four-discourse framework for KM research.

Three major research paradigm schemes are grouped in Figure 2.4 in different text colors to compare the paradigms and classification dimensions used. It is found that although different dimensions are adopted to categorize research paradigms, the resulting classifications are quite similar to each other in terms of their underlying philosophical views and assumptions. Yet, as Hislop (2009, pp. 16-17) discovered and showed in Table 2.2, different terminologies are used to describe the same paradigm. As the labels for research paradigms continue to evolve and the paradigms are also classified along different dimensions, it is difficult to verify which labels describe the paradigms more succinctly. To avoid this terminology confusion, and considering that these paradigms bear very similar epistemological and ontological assumptions, it is more revealing to group them by their philosophical views instead. Positivism and interpretivism are frequently identified in the literature as the two

most predominant paradigms for KM research (Guo & Sheffield, 2008, p. 675; Sheffield, 2009; Hazlett, McAdam, & Gallagher, 2005, p. 36; Higgs & Titchen, 1995; Meyer & Sugiyama, 2007; Venters, 2001). Another paradigm, “critical inquiry”, is also included in order to illustrate the power relations problem in KM that is relevant to this research (Sheffield, 2009; Guo & Sheffield, 2008).

Figure 2.4 Comparisons of Different Research Paradigm Schemes



- (a) Burrell and Morgan’s (1979) four-paradigm scheme
- (b) Deetz’s (1996) four discourses of organizational inquiry
- (c) Schultze and Stabell’s (2004) four discourses of KM research

Table 2.2 Competing Epistemologies (Hislop, 2009, p. 17)

Authors	Objectivist perspective	Practice-based perspective
Schultze & Stabell (2004)	Epistemology of duali[sm]	Epistemology of duali[ty]
Werr & Stjernberg (2003)	Knowledge as theory	Knowledge as practice
Empson (2001)	Knowledge as an asset	Knowing as a process
Cook & Brown (1999)	Epistemology of possession	Epistemology of practice
McAdam & McCreedy (2000)	Knowledge as truth	Knowledge as socially constructed
Scarbrough (1998)	“Content” theory of knowledge	“Relational” view of knowledge

2.1.2.1 Positivism

Overview of the philosophy

Originated in the British empiricist school of the 17th and 18th centuries, positivism is associated with the functionalist or neo-functionalist or cognitivist perspective owing largely to the influence of the cognitive revolution in the 1950s that studied human mental processes in the areas of artificial intelligence and computer science. As a result, knowledge is regarded as universal; two cognitive systems should achieve the same representations of the same object or event (von Krogh, 1998, p. 134). It believes that all true knowledge is scientific and there is an underlying objective reality which can be discovered (Wicks & Freeman, 1998, p. 125). Thus, it assumes that the functioning of the world is governed by a set of laws of cause and effect, which can be discerned by scientific methods (Hislop, 2009, p. 19), the core of which are modern logic, observation, experiments and measurements. Human knowledge is discovered and justified by sense experience and empirical processes, which are reductionist, value-free, quantifiable, objective and operationalisable (Higgs & Titchen, 1995, p. 523). Deductive reasoning is only used to postulate hypotheses that can be further tested and verified. In organizational management, this paradigm seeks to look for regularities that will lead to generalizations and universal principles; and takes the managerial view that an organization structure is an objective phenomenon that will shape the activities of its members in deterministic ways (Gio & Pitre, 1990, p. 590).

Characteristics of Knowledge

1. Knowledge as a commodity

Called “mainstream thinking” (Stacey, 2000) which was the most predominant view in the KM literature especially in the 80s and early 90s, positivism has the view that knowledge should be defined as a commodity (Glazer, 1998, p. 176; Gibbons et al., 2000,

as cited in Kakabadse, Kakabadse, & Kouzmin, 2003, p. 82) and as the truth (Alvesson & Willmott, 1996). It is like a stock or a thing “‘out there’, for which we can gain positive evidence” (Spender, 1998b, p. 234). Being an object and an entity, knowledge is something that can be encoded, stored, measured, transmitted easily to others and separated from the person who possesses and uses it (McQueen, 1998; Swan & Newell, 2000, p. 592; Hislop, 2009, p. 9; Nonaka & Peltokorpi, 2006, p. 75, Spender, 1998b, p. 234; Zack, 1998). The metaphors of drilling, mining and harvesting are often used to describe how these “reservoirs” of knowledge can be managed.

2. Knowledge hierarchy

Some positivists take a taxonomic view to fit knowledge in the hierarchy of data, information, knowledge and sometimes wisdom in an attempt to explain their differences (Alavi & Leidner, 2001; Allee, 1997b; Davenport & Prusak, 1998; Dreske, 1981; Machlup, 1980; Nissen, 2000; Nonaka, 1994; Vance, 1997). Yet, only data has an agreed definition as discrete facts; other concepts, particularly information and knowledge, are still loosely understood and sometimes used interchangeably. This greatly limits the contribution of the hierarchy to the clarity of the notion of knowledge. Stenmark (2002, p. 929) summarized these definitions in Table 2.3 from a handful of KM literature to provide a snapshot of the situation.

Stenmark objected to the commonly held view that these entities are in a linear relationship whereby data is transformed into information and which in turn is transformed into knowledge. Nor did he concur with the view of Tuomi (1999) that the hierarchy is in inverse relationship in which knowledge must exist for the formulation of

information and data will emerge from adding value to information. He (Stenmark, 2002) offered a different view on the differentiation of these concepts:

Data and information are only two opposite ends on a continuum. We can concentrate our attention to certain aspects of knowledge, making it focal. The focal knowledge can, sometimes and partially, be articulated and furnished with words. I refer to this as information. If the information becomes too de-contextualized, i.e. too distant from the knowledge required to interpret it, I shall call it data. (p. 930)

Table 2.3 Definitions of Data, Information, and Knowledge

Author(s)	Data	Information	Knowledge
Wiig, 1993	–	Facts organized to describe a situation or condition	Truths, beliefs, perspectives, judgments, know-how and methodologies
Nonaka & Takeuchi, 1995	–	A flow of meaningful messages	Commitments and beliefs created from these messages
Spek & Spijkervet, 1997	Not yet interpreted symbols	Data with meaning	The ability to assign meaning
Davenport, 1997	Simple observations	Data with relevance and purpose	Valuable information from the human mind
Davenport & Prusak, 1998	A set of discrete facts	A message meant to change the receiver's perception	Experience, values, insights, and contextual information
Quigley & Debons, 1999	Text that does not answer questions to a particular problem	Text that answers the questions who, when, what, or where	Text that answers the questions why or how

Hicks, Dattero and Galup (2007) also acknowledged the limitations of the knowledge hierarchy. Davenport and Prusak (1998, pp. 4-7) arrived at a similar view too. Data, information and knowledge (D-I-K) can change their states from time to time by moving one level up along this D-I-K value chain or moving down to return to their original states via de-knowledging. The difference with Stenmark (2002) is that they rather emphasize

the value-added processes in this transformation of states - the 5C processes of contextualization, categorization, calculation, correction and condensation to turn data into information, and 4C processes of making connection, comparison, assessment of consequences and conversation to transform information into knowledge. However, like many other theorists, they also commit the common error of defining knowledge in terms of information. Knowledge is defined as “a fluid mix of framed experience, values, contextual information, and expert insight...” (p. 5), though it has been emphasized from the start that knowledge is neither information nor data.

3. Agency problem in KM

In discussing the differences of knowledge with data and information, Alavi and Leidner (2001, p. 109) argued that the most distinguishing factor was not on content, structure, accuracy or utility, but the fact that “knowledge is information possessed in the mind of individuals: it is personalized information ... related to facts, procedures, concepts, interpretations, ideas, observations, and judgments”. Cook and Brown (1999, p. 384) also stated that knowledge is something that is held in a person’s head. These bring about the agency problem (a knower) in the KM discourse. One of the assumptions of positivists is that knowledge is primarily a cognitive process, both for individuals and organizations. Organizational knowledge is simply the summation of individual knowledge.

4. Knowledge typology

The categorization of knowledge into different typologies is derived from the either/or logic of the positivist’s perspective. According to Hislop (2009, p. 23), two of the most common distinctions made are between tacit and explicit knowledge, and individual and collective knowledge.

Nonaka's (1994) tacit-explicit dichotomy is the most popular. He defined explicit knowledge as expressible in "formal and systematic language and shared in the form of data, scientific formulae, specifications, manuals and such like" (Nonaka, Toyama, & Konno, 2000, p. 7). As such, it can be codified and transmitted between individuals or embedded in documents or database repositories in organizations (Davenport & Prusak, 1998, p. 5). It refers to "know-what" of human knowledge. This is commensurate with the positivists' view that knowledge is objective and can be easily encoded. But the interpretation of tacit knowledge did not exactly follow the line of thoughts of Polanyi, who is in opposition to the positivist account of science. Polanyi (1966) never clearly laid down the definition of tacit knowledge except as implied in the phrase "we know more than we can tell" (p. 4) that it is inexpressible. Nonaka follows this to define tacit knowledge as personal, context-specific and therefore hard to articulate in words and numbers. But he further expands Polanyi's ideas in a more practical direction. Tacit knowledge is assumed to be consisted of both cognitive and technical elements. The cognitive elements refer to "mental models" in which "human beings form working models of the world by creating and manipulating analogies in their minds" (Nonaka, 1994, p. 16). They include schemata, paradigms, perspectives, experiences, intuition, beliefs, problem-solving ability and the frame of interpretation within which a judgment is made. The technical elements refer to know-how or craft and skills of a person. Both tacit and explicit knowledge do not remain at an individual level only; it can be converted from one form (tacit) into the other (explicit) and contributes directly to the growth of organizational knowledge. In this SECI model, Nonaka and Takeuchi (1995, p. 71) argued that there was special knowledge content in each knowledge conversion mode and identified four types of knowledge, namely, "sympathized knowledge", "conceptual knowledge", "systemic knowledge" and "operational knowledge" that were associated

with the processes of socialization, externalization, combination and internalization respectively.

Apart from explicit and tacit knowledge, both Spender, and Firestone and McElroy identified “implicit knowledge” as the third category of knowledge. While Spender (1998a, p. 24) had the intention of replacing tacit knowledge with this term, Firestone and McElroy (2003, p. 21) defined this term as implicit beliefs “held in the form of conceptual framework, as expressed in our language” (Polanyi, 1962, pp. 286-287). It is neither focal nor explicit, but expressible given the right environmental condition conducive to its expression. But no matter it is tacit, implicit or explicit knowledge, Choo (2006, p. 136) believed that these various kinds of organizational knowledge must be built on “cultural knowledge”, which was “shared beliefs, assumptions and norms [that] form the framework in which organizational members understand their work and its purpose, perceive problems and opportunities, and assess the value and potential of new knowledge” (p. 144). Blackler (1995, pp. 1023-1024) also obtained five other types of knowledge that were summarized from the literature. They are embrained (conceptual skills and abilities), embodied (action oriented and explicit), encultured (shared understanding), embedded (resided in technologies and procedures) and encoded (signs and symbols) knowledge. Boisot (1995, p. 186) upheld the positivists’ view that knowledge was a stock of usable assets. In his I-space model, he introduced four categories of knowledge classified along the dimensions of codified or uncoded, abstract or concrete, and diffused or undiffused: personal knowledge (uncoded, concrete and undiffused), proprietary knowledge (codified, abstract and undiffused), public knowledge (codified, abstract and diffused), and common sense (uncoded, concrete but diffused).

With a view of developing a dynamic theory of firms, Spender (1998b, p. 238) adopted the approach of pluralist epistemology to classify organizational knowledge into four types based on Polanyi's (1962) standard explicit-implicit dimension and a new ontological dimension of individual-social taken from Durkheim and Halbwachs. As shown in Table 2.4 below, there are conscious (explicit) and automatic (implicit) knowledge on the individual side and objectified (explicit) and collective (implicit) knowledge on the social side. Both of them are defined in as much the same way as that of Nonaka and Takeuchi (1995). On the individual side, conscious knowledge is acquired from scientific and technical training while automatic knowledge refers to the employee's skilled practices, automatic skills, hunches and intuitions (Spender, 1996a, p. 51). On the social side, objectified knowledge refers to a firm's established standards and practices while collective knowledge is embedded in a firm's routines, norms and culture (Spender, 1996a, p. 52). Spender believed that each real firm should have a mixture of these four types of knowledge and different strategies in making use of them. Collective knowledge is the most powerful strategically as it is both relatively immobile and historically contingent and thus relatively inimitable (Spender, 1996b, p. 73). It is also situated and embedded in the organization as COP (Spender, 1996b, p.75). This quadrant is where new knowledge is produced and Spender (1996b, p. 74) has proved empirically how collective knowledge is recovered through the movement of different types of knowledge around the matrix. This four-fold matrix is also more extensive than the two-fold pluralist epistemology of Nonaka and Takeuchi (1995).

Table 2.4 Different Types of Organizational Knowledge (Spender, 1996a, p. 52)

--	Individual	Social
Explicit	Conscious	Objectified
Implicit	Automatic	Collective

Other typologies concerning knowledge includes declarative (know-about), procedural (know-how), causal (know-why), conditional (know-when), and relational (know-with) (Alavi & Leinder, 2001, p. 112).

Approaches to KM

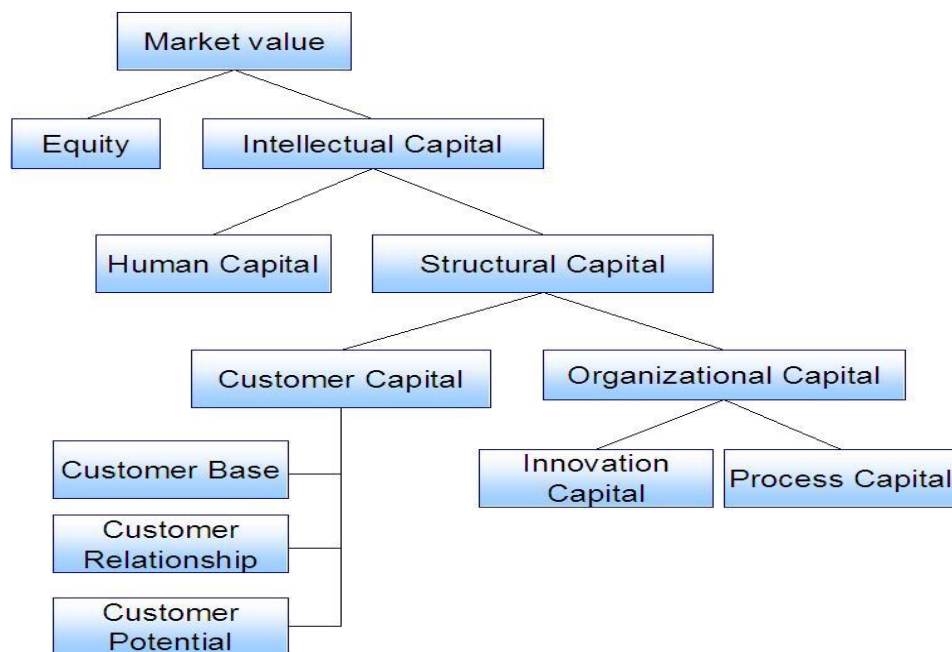
The above characteristics illustrate quite clearly a mechanistic view on the nature of knowledge, which, as Scarbrough and Swan (2001) claimed, has much to do with the commercial exploitation of the ideas of KM. In the 1990's, in response to the growing globalization and knowledge-based post-industrial economy, and in recognition of the weakness of the Porter's theory to focus solely on external market positioning, the knowledge-based view of the firm rapidly emerged as an important strand of the resource-based view to take the interests of the firm to go beyond the notion of knowledge as entirely a core competence to develop knowledge as a vital asset contributing to the competitive advantage of the firm. Knowledge is then coined as "intellectual capital" and a firm is regarded as an institution for generating and applying knowledge (Grant, 2006, p. 26). This new knowledge-based view dominates much of the positivists' approaches to KM.

1. Intellectual capital (IC) approach:

It is generally agreed that the IC approach is based on Sveiby's (1997) early works on "Intellectual Capital" and Edvinsson's works at Skandia (Edvinsson & Malone, 1997), in

which knowledge is treated as an intangible asset of an organization to enhance and sustain its competitive advantage (Roos & Roos, 1997). KM is defined as “the systematic underpinning, observatism, measurement and optimization of the company’s knowledge economies” (Demarest, 1997, p. 379). Its role in the company is to formulate “a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance” (O’Dell, Essaides, & Grayson, 1998, p. 6).

Figure 2.5 Skandia IC Model of KM (McAdam & McCreedy, 1999a, p. 97)



The Skandia model above represents a typical IC model. Amongst the three kinds of IC, namely human, structural and customer capital, human capital is the most critical. It includes knowledge, skills and abilities of employees; and is supported by structural and customer capital under the assumption that individuals, not the company, own and control the chief source of competitive advantages. The IC model also takes the view that knowledge is subjected to scientific management and vigorous measurement. The latter

is given strong emphasis when Skandia included IC into its annual report (McAdam & McCreedy, 1999a, p. 97).

Much of the thinking of the IC approach is popularized in the vast array of writings of Nonaka (1994), Leonard-Barton (1995), Davenport and Prusak (1998), and Stewart (1997). To Nonaka (1991), “The one sure source of lasting competitive advantage is knowledge” (p. 96). His SCEI model takes the assumption that knowledge is an asset that can be converted from one form to another. Davenport and Prusak (1998) believed in the power of knowledge markets and asserted that knowledge can be “exchanged, bought, bartered, found, generated, and applied to work” (p. 25). The notion of sustainable competitive advantage is treasured in their works, especially in terms of innovation. Leonard-Barton (1995) valued the tacit knowledge of individuals as the “wellspring of innovation”. Stewart (1991) termed knowledge as “brainpower” and the purpose of KM is to exploit to the full the IC of employees so that it could be captured, stored, sold and shared for the long-term performance of the organization.

2. Process approach

The IC approach raises the strategic importance of knowledge. KM becomes the new strategic direction to pursue and is linked directly with the performance of the organization. To achieve this, KM takes a process approach that involves “creating, capturing, and using knowledge to enhance organizational performance” (Bassi as cited in Scarbrough, Swan, & Preston, 1999, p. 22). Hedlund (1994) also emphasized the way KM handled the creation, storage, transfer, transformation and application of organizational knowledge. Others such as Skyrme (2003) who defined KM as “the explicit and systematic management of vital knowledge and its associated processes of

creating, gathering, organizing, diffusion, use and exploitation” (para. 5), Hibbard (as cited in Beckman, 1999) who likened KM to “the process of capturing a company’s collective expertise wherever it resides – in databases, on paper, or in people’s head – and distributing it to wherever it can help produce the biggest payoff” (p. 6), and the claim of Davenport and Prusak (1998) that KM is the process of capturing, distributing and effectively using knowledge, also purport the view that KM is an ongoing process. This approach also focuses on the application of expertise. Thus, Zack (2006) proposed the use of a Strategic Knowledge Map to maximize an organization’s competitive position.

3. Information Systems / Information Technology (IS / IT) approach:

The dominant view of knowledge as a stock is reflected in the lavish use of technology to capture it in knowledge databases. In fact, as Grant and Grant (2008, p. 577) remarked, the proliferation of computers, the Internet, and other IT technologies in the 1990s made them indispensable to the codification, storage, retrieval and transmission of knowledge. People find it effective to use IS / IT systems to codify not only explicit knowledge that can be found in books, manuals, procedures and the like, but also to explicate tacit knowledge resided in experts’ minds with the optimism that “it is possible to convert much of this knowledge into an explicit form” (Hislop, 2009, p.27). Scarbrough and Swan (2001, p. 7) found in their literature review of KM that the IS / IT theme accounted for approximately 70% of all themes discussed in the KM articles published in 1998. Earl’s (2001) technocratic approach to KM highlights the role played by IT systems. Under the so-called “codification strategy” of Hansen, Nohria, and Tierney (1999), various KM databases and repositories accessible by all members of an organization were established one after another. Alavi and Leidner (2002, p. 114) summarized from the literature three main applications of IT in KM: i) the coding and sharing of best practices,

ii) the creation of corporate knowledge directories and iii) the creation of knowledge networks. In this approach, KM is equated with data mining and knowledge as stockpiles that can be captured, represented, codified, transferred and exchanged.

Criticism of Positivist Approach to KM

The assumptions of the positivist approach were quickly called into doubt by scholars who view knowledge as a duality consisting of both hard and soft components. They regard knowing as a complex process. The mere existence of codified knowledge is thought insufficient to be transformed into internal knowing without taking into account political and social aspects of knowledge, and subjective and situational aspects of humans such as ideals, intuition, experience and values (Hildreth & Kimble, 2002, para. 33; McAdam & McCreedy, 1999a, p. 97; Nonaka & Peltokorpi, 2006, p. 79). Lehaney, Clarke, Coakes, and Jack (2004) succinctly summarized the shortcomings of the positivist approach in accommodating the “soft” side of knowledge:

In the study of social systems, where the key to the functioning of the system is human activity, functionalist views are questioned. Experimentation is of limited value in such systems: the utility of problem solving, functionalist techniques is diminished when dealing with ill-defined, highly complex human activity systems. (p. 101)

In addition, Swan and Newell (2000) pointed out that the commodity view of knowledge negated the highly inarticulate and situated nature of tacit knowledge and thus the attempt to abstract it from its context of application was to lose much of its intrinsic meaning. Nonaka and Peltokorpi (2006, p. 78) further criticized that positivism has limited potential to explain

the knowledge creation process which remains a ‘black box’ because the static positivist ontology does not allow for processual conceptualization.

As a result of these limitations, “softer” methods of approaching KM issues are seen to be of greater value. The interpretive philosophies guided by sense-making, social constructionism, and the paradigm of critical inquiry gain growing popularity. Some turn to a third scenario where multiple perspectives can co-exist. The next two sections will review the significance of interpretivism and critical inquiry.

2.1.2.2 Interpretivism

Overview of the philosophy

Rooted in the social thoughts of Kant and the epistemological development in the 20th century, interpretivism is associated with a number of different philosophical perspectives, all sprang from the philosophy of phenomenon to some extent. This includes hermeneutics, constructivism, phenomenology, pragmatism and ethnography. All these philosophies emphasize subjectivity in stark contrast to objectivity of positivists. Scholars taking this paradigm “do not look for cause-effect relationships or use the experimental method, rather they look at the whole and take account of the context of the situation, the timings, the subjective meanings and intention within the particular situation” (Higgs & Titchen, 1995, p. 524). Their goals are to understand the fundamental nature of the social world as it is at the level of subjective experience and seek explanation within the realm of personal consciousness. They tend to see from the perspective of the person experiencing the events and avoid *a priori* conceptions as far as possible in order to explore in depth the world of the individual involved. Conclusions are drawn from inductive reasoning through a series of cyclical and iterative processes. The focus is to restore the contextual, provisional, subjective,

situational and interactive nature of knowledge, and to uncover the socially constructed meaning of realities as understood by an individual or groups (Nonaka & Peltokorpi, 2006, p. 75; Guo & Shefileds, 2008, p. 676; Swan & Scarbrough, 2001, p. 916; Gioia & Pitre, 1990, p. 588). The understanding of the world in turn does not reside in people's minds, but is reflected in what they practice. Again, following Polanyi's thoughts, they argue that while the metaphor of knowledge is mind, the mind understands the world through the unarticulated background that provides a set of subsidiary particulars for people to integrate them tacitly. Interestingly, these particulars reside in the social practices that people know by having been socialized into it by others or by participating into it. The locus of a person's knowing is not in his head but implicit in the activity he engages (Tsoukas, 1996, p. 16). Thus, in interpretivism, knowledge is manifested in actions. In short, the interpretivist research framework emphasizes understanding, communication and action.

Characteristics of Knowledge

Hislop (2009, p. 34) summarized six different characteristics of knowledge from the literature: embedded in practice, inseparability of tacit and explicit knowledge, embodied in people, socially constructed, culturally embedded and contestable. But some of them are duplicated with each other, thus, they are re-categorized as follows:

1. Knowledge is a social construct

To social constructionists, knowledge is "an internal construction or an attempt to impose meaning and significance on events and ideas" (Higgs & Titchen, 1995, p. 524). They believe that the world is 'out there' but there is no one truly objective account of the situation. Instead, the reality is socially constructed depending on how people make sense of their worlds on the basis of their idiosyncratic experiences and how to create a

system of meanings in dialectical interaction with society at any time. As a result, all facts about the world are subjected to personal interpretation and narratives that are embedded in individual experience, language and culture. Human knowledge is a way of “enacting reality, giving existence to things and events, and organizing the world” (Swan & Scarbrough, 2001, p. 916). It is situated in a particular social and historical context (Fuller, 2002). Its production and interpretation, as Hislop (2009, p.40) remarked, required the two processes of sense-giving and sense-reading of Polanyi, or perspective-making and perspective-taking of Boland and Tenkasi (1995). With this fluid, inter-subjective and social character, Pan and Scarbrough (1999) defined knowledge in a more holistic sense as “multi-layered and multi-faceted, comprising cognition, actions and resources. It is socially constructed and embedded in social networks and communities of practice” (p. 360).

2. Knowledge is a flow

Closely associated with the characteristics of meaning construction is the definition of knowledge not as a “thing” but also as a “flow”. This notion of flow was deliberated in Fahey and Prusak’s (1998, p. 266) paper which described knowledge as in constant flux and change, created individually, self-generating and inseparable from the individuals who developed, transmitted and leveraged it. This concept was later taken up by Brenda Dervin and David Snowden, the leading authorities in sense-making theories. Dervin’s (1998) definition of knowledge as “the sense made at a particular point in time-space by someone” (p. 36) clearly illustrates the “flow” concept from a user-centered perspective. Knowledge is considered as sometimes objective, sometimes subjective; sometimes it is a fact; and sometimes it is a piece of information; and in some other time-space, it can be fleeting and unexpressed. In her view, sense-making and sense-unmaking are the mandate

of human condition. They are the means for a person to move through gappy situations at any given time-space. They are thus knowledge, and which is activities embedded in time space. In short, knowledge is treated as a communicative practice that requires interrogation and interpretation, and Dervin's (1998, p. 39) approach is to find out what users really think, feel, want and dream – a phenomenologist approach that defies codification as the only strategy of KM.

The flow concept is more evident in the sense-making theory of Snowden (2000; 2002) who broadens the definition of knowledge to being a thing and a flow. His Cynefin model tends to look at the knowledge space an organization is situated, namely “known”, “knowable”, “complex” and “chaotic”, and its evolution from one place to another in making sense of the ambiguities, uncertainties and diversities of the society it is living. Detailed comparison of the sense-making theories will be covered in Chapter Three. Here it is suffice to conclude that knowledge as a flow concept is attracting increasing attention.

3. Knowledge is practice-based

Another distinguished view on organizational knowledge in interpretivist paradigm is to assume that knowledge is inseparable from practice and action. Brown and Duguid (2001) proposed to look at knowledge through the prism of practice as it was only through learning by doing that knowledge was created. A number of examples abound in the literature to illustrate the perspective of knowledge as a practice. Orlikowski (2002) drew on her empirical study of the success of a global product development organization to highlight the importance of enacting collective capability of its members in organizing that is grounded in everyday practice – “situated and ongoing accomplishment that

emerges from people's everyday actions” (p. 269). She argued strongly that all knowing was doing and the human agency was critical in knowledgeable performance. Patriotta’s study further demonstrated the fact that knowledge was embedded in the narratives possessed by workers, and DeFillippi and Arthur’s study of film production illustrated the essential role of learning by watching (Hislop, 2009, p. 36).

4. Tacit and explicit knowledge are inseparable

The practice-based perspective discussed above strongly implies an important assumption in the interpretivist camp that tacit and explicit knowledge are inseparable. In congruence with the line of thought of Polanyi on tacit knowing, it is argued that tacit and explicit knowledge are mutually constituted and tacit knowledge is the component of all knowledge (Tsoukas, 1996; Orlikowski, 2002; Schultze & Stabell, 2004). Similarly, individual knowledge and social knowledge are mutually defined; the former is not simply the aggregation of the latter as the positivists have assumed. This will be further deliberated in Section 2.2. In short, in the discourse of the constructionists, there is no knowledge typology or dichotomy.

Approaches to KM

1. Communities of Practice (COP) and sharing of knowledge

The constitutive view of knowledge is best reflected in the COP approach to KM. The KM literature vastly acknowledges the importance of cultivating COPs for sharing of organizational knowledge. Lave and Wenger’s book (1991) is generally regarded as the origin of the idea, though Wallace (2007) argued that this concept has been prevalent in medicine, law, psychology, education, and theology for quite some time since as early as 1864. In fact, he was critical that Lave and Wenger’s book (1991) provided just 10

references to the term and thus it becomes peripheral to the major discussion (Wallace, 2007, p. 57). Instead, Wenger (2000; 2006; Wenger & Snyder, 2000; Wenger, McDermott, & Snyder, 2002) is the authority in the COP research. According to his perspectives, COPs are defined as “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Wenger, 2006, para 1). They must be consisted of the following three crucial characteristics:

- a). domain – an identity defined by a shared domain of interest, which implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people
- b). the community – members engage in joint activities and discussion, help each other share information, interact and learn together
- c). the practice – not a community of interest, but a community of practitioners that join together to develop a shared repertoire of resources such as experience, stories, tools or in other words, a shared practice, that takes time and sustained interaction, and that may be more or less self-conscious. Examples include nurses who meet regularly for lunch in a hospital cafeteria and thus may unconsciously indulge in discussions that will develop into rich sources of knowledge about how to care for patients.

The COP approach to KM is valuable in its capacity to create, accumulate and diffuse knowledge in an organization. By allowing members in a COP to share and exchange experience and knowledge in a free and creative way, COPs are privileged sites for a tight and effective loop of insight, problem identification, learning and knowledge production (Brown & Duguid, 2001, pp. 202 - 203). Informal COPs have more power than the conventional organization to link working, learning, and innovation more closely, more realistically and more reflectively to achieve successful synergy to bring improvement to

all three (Brown & Duguid, 1991). The broad spectrum of membership with a key domain of interests facilitates active learning from peers and, by means of active participation, fosters the development of professional competencies and preserves tacit aspects of knowledge that other systems cannot capture (Wenger, 2000, p. 214; Wenger & Snyder, 2000, p. 141). They thus provide significant repositories for the development, maintenance, and reproduction of knowledge. They are also helpful to recruit and retain talents for an organization. Most important of all, the emphasis of COPs on relationships, shared understandings and attitudes to knowledge formation and sharing makes them an ideal forum for the transfer of best practices, tips, lessons learned and feedback (Swan & Newell, 2000; Wenger, 2000, p. 213; Wenger & Snyder, 2000, p. 141). The resulting improvement in organizational performance will directly or indirectly drive business strategy.

In a nutshell, COPs are regarded as the Holy Grail of KM (Wenger, 2000, p. 223), the most appropriate avenue for the selection and application of explicit knowledge alongside the locally situated, contextually specific and often tacit knowledge about organizational practices and processes. Cultivating COPs in strategic areas thus becomes a practical way to manage knowledge. Swan and Newell (2000) put the emphasis on establishing shared values, trust and understanding that are essential for the creation and application of knowledge in ways that are locally meaningful and relevant. Wenger and Snyder (2000, p. 144) suggested identifying potential COPs that will enhance the company's strategic capabilities; providing the infrastructure and necessary resources to support such COPs such as giving members time and sponsorship to enable them to apply their expertise effectively; and using non-traditional methods to assess the value of the company's COPs

such as listening to members' stories, which can clarify the complex relationships among activities, knowledge and performance.

Learning is the key to the success of COPs. Lave and Wenger (1991) were the pioneers in exploring the model of workplace learning in COPs by extending the concept of apprenticeship to a more general theory of situated learning as the means to build legitimate peripheral participation (LPP) in COPs. In the foreword in Lave and Wenger's book (1991, p. 14), W.F. Hanks elucidated that this model of LPP and situated learning did not take into account formal education and schooling but focused on the relationship between learning and social situations in which it occurs. It explores the situated character of human understanding and communication, a point shared by Dervin as well. Learning is situated in certain forms of social co-participation (Lave & Wenger, 1991, p. 14). Individual learners are not receivers of explicit and abstract knowledge from someone who knows it but "construct their understanding out of a wide range of materials that include ambient social and physical circumstances and the histories and social relations of the people involved" (Brown & Duguid, 1991, p. 47). Under LPP, learning is a peripheral activity that requires learners to be enculturated and engaged in the process to acquire the knowledge and skills that are needed to behave as community members. Learners are to become practitioners rather than to learn about the practice. As they actually participate in the practice of their community, they will move gradually from a partially peripheral role to a fundamental central role (Wallace, 2007, p. 55).

It is worth noting that LPP is a kind of workplace learning that is highly situated in the practices and communities in which knowledge occurs. It shares many concepts of Dervin's Sense-Making theory. Should it be successfully formulated into a complete

theory of workplace learning, it can be taken as the research model of this research. However, as Wallace (2007) commented, though the model provided important insights into the nature of apprenticeship and workplace learning more generally, it also had a number of limitations to make it into a learning theory. As he rightly pointed out, “case study research into complex institutional settings suggests that patterns and forms of participation are highly diverse. Further in-depth studies of workplace learning in a wide range of contexts are required if all the issues affecting learning and their inter-relationship are to be fully understood and theorized.” (p. 62). This partly explains why there is a need for this research to study knowledge creation and utilization in healthcare organizations.

2. People-Centric strategy

Hansen, Nohria, and Tierney (1999) put forward two contrasting strategies for managing knowledge. Positivists are in favor of “codification strategy” which widely employs technology to codify and store knowledge in databases. Interpretivists, while not rejecting the value of technology, find that this overly techno-centric emphasis has not paid due concern to social networks of people and the contextual nature of knowledge (Hazlett, McAdam, & Gallagher, 2005, p. 37). They advocate “personalization strategy” as the alternative to shift the focus to improving social processes for knowledge sharing, which support their assumptions that knowledge is closely tied to the person who develops it and the primary mode of knowledge transfer is direct interaction among people; computers are to facilitate people to communicate knowledge, not to store it (Hansen, Nohria, & Tierney, 1999, p. 107). It also bears close resemblance to Sveiby’s (2001a) people-track management, which is concerned with maximizing the ability of an organization’s members to create new knowledge and build environments conducive to

the sharing of knowledge. Ashby's (1956) law of requisite variety and later Espejo's (1993) paper on requisite variety also emphasized the importance of providing KM solutions that focused upon human action as well as the provision of information, pointing out clearly that as an individual's knowledge will become outdated quickly, it is more crucial to provide the structure to support a member of an organization to respond to changing environment than to merely provide the information itself (Venters, 2001).

3. Reflective practice

Reflective practice follows on the practice-based perspective on knowledge, but further claims that new understanding only comes from reflection. Schon (1982, pp. 15-16) studied professional practice and asserted that the situations of practice were not problems to be solved as positivists think but problematic situations characterized by uncertainty, disorder and indeterminacy. He developed "reflective practice" to address these situations. It consists of two key concepts:

- Reflection-in-action: refers to the reflective thinking one is doing while one is doing the action. This applies in familiar situations and has many parallels with Polanyi's tacit knowing.
- Reflection-on-action: occurs in new and unfamiliar situations which require one to make sense of the situation, reflect upon what one is doing, make new sense of the uniqueness of the situation, and to consider or improvise new ways of handling the situation (Teekman, 2000; Venters, 2001)

Reflection-on-action requires one to have a certain level of experience to enable him or her to step back to shift the focus from doing the action to how the action is done

(Stenmark, 2002, p. 934). Finally, new heuristic knowledge may emerge. This has many parallels with Dervin's SMM.

4. Dialogue and Storytelling

The interpretivists' understanding of knowledge suggests that it is fragmented and dispersed in an organization. Knowledge sharing thus depends on interpersonal communication rather than the transmitter-receiver model espoused by positivists in order to develop a perspective from different interpretations of organizational members. This communicative approach to KM is in fact the central idea of Dervin' SMM (1998). Dialogue and language are keys to this process to enable the exchange and evaluation of knowledge. Again, Snowden (2002), another leading authority in sense-making theories, put narratives and storytelling at the centre of knowledge transfer. He argues that stories serve as effective agents through whom people can present events in the form of a plot to pass on their experience and the embedded meaning in the way they wish and the listener to digest and create their own meaning.

2.1.2.3 Critical Inquiry

A third perspective on organizational knowledge is concerned with conflicts and power relations at work. It assumes that the society is stratified and made up of antagonistic factions: a powerful group versus a powerless group that illustrates an ongoing contradictions and exploitations. Applying to an organization, knowledge is regarded as an object that can be sold, owned and employed to dominate over others or to empower people to change the world and to emancipate the abused and mistreated (Schultze & Stabell, 2004, pp. 558 - 559). In other words, KM cannot be separated from politics. A good KM practice must resolve organizational members' competing values, mutually supportive interpersonal relationships

and access to power. Guo and Sheffield (2008, p. 674) quoted Pozzebon and Pinsonneault's research to show the way the conflicting views of clients and consultants evolve through mediation in the customization of complex software artifacts. Supporters of this paradigm see knowledge creation as a dialectical process in which the deeply-held beliefs and commitments of individuals are dynamically created out of contradictions and whereby individuals confront their own most cherished assumptions and a synthesis of different perspectives emerges (Sheffield, 2009, p. 391). They find that it is not sufficient for interpretivists to move away from the mechanistic view of positivists; KM still needs to confront the conflicts and the relations to power that are inherent in knowledge creation (Sheffield, 2009, p. 391). Frederick Taylor's scientific management is exemplary of this perspective (Schultze & Stabell, 2004, p. 559). The use of emancipatory knowledge in clinical reasoning is another area that employs this paradigm in managing knowledge (Higgs & Titchen, 1995, p. 524).

2.1.3 Working Definition of Knowledge

The above literature review clearly illustrates the limitations of the positivistic approach in the understanding of knowledge. The interpretive philosophy also has its own inadequacies to explain the relationship between knowledge and performance, and how knowledge that stays within a person's own mind can be extended to the whole organization to become organizational knowledge (Nonaka & Peltokorpi, 2006, p.80). Weicks and Freeman (1998, p. 128) further emphasized that interpretivists failed to provide concrete meaning to their meaning-creating activities. Soute (2007, p. 69) rejected both philosophies arguing that their different ways of understanding knowledge generated contradictions: "KM results were required based on an interpretivist understanding of knowledge (i.e., where the social and human nature are emphasized), but conversely, KM was made operative by a functionalist

perspective (i.e., which is embedded in its concepts, practices, methods and tools)". Some proposed a synthesis of both positivistic and interpretive philosophies (Hildreth & Kimble, 2002; Nonaka & Peltokorpi, 2006; Spender, 1996b). Sheffield (2009, p. 393) suggested combining some elements of the three paradigms of positivism, interpretivism and critical inquiry to become a Habermasian inquiry system that established relevance to the framework of KM through three intersecting knowledge domains of knowledge application, knowledge normalization and knowledge creation respectively. Schultze and Stabell (2004, p. 568) advised that, even though cross-paradigm dialogue for KM research was recommended, it was hard for a single piece of research to take on multiple perspectives. For the purpose of this research, I will adopt the interpretive stance with consideration of a critical inquiry perspective.

First, it is clear from the above historical review of epistemology that with the pragmatist turn in the 20th century, propositional and explicit knowledge are no longer regarded as the sole basis of knowledge and the shift of focus to interpretive philosophies is strongly evident. Second, the interpretivist dialectic perspective on tacit knowledge that does not separate knowledge from action is much more in line with Polanyi's (1966) original meaning of tacit knowing (Schltze & Stabelll, 2004, p. 563). It is crucial to acknowledge this action component in knowledge. Imagine a red light on the dashboard can mean a low oil level, a low petrol level, or a warning that a brake is not functioning. Knowledge about the car is to enable an individual to choose the right action at the right time. The problem of the positivist approach lies in its inability to explain the behavior of the social world, which is determined by the meaning attributed by individuals to their actions. Third, the stronger emphasis of an interpretivist view to call for meaning and understanding is what is needed in knowledge creation, which underlines a dynamic process of sense making rather than being restricted

solely to the assimilation of a body of facts (MaAdam & McCreedy, 2000, p. 159). Fourth, any social relationship that underpins work will inevitably involve power and conflicts. It is impossible to approach knowledge at work without acknowledging the existence of power relations. The approach of critical inquiry “enables us to understand better not only particular bodies of knowledge but also why certain kinds of knowledge are more privileged over others” (Tsoukas & Mylonopoulos, 2004, p. S3). This is particularly relevant to the healthcare field.

Amongst myriads of interpretive philosophies, sense-making theories stand out as the most sensible and appropriate approach for this research. As aforementioned, Dervin’s SMM contains many parallels with the problem-solving and the corresponding scientific discovery theory of Polanyi. The theories are concerned with how people respond to or interpret stimuli in an equivocal situation at a particular point in time-space. They encompass many social constructionist views and also emphasize the importance of power in social relationships. In this regard, I would take the following components of knowledge from the centerpiece of sense-making theories (Evans & Alleyne, 2009, p. 148; McAdam & McCreedy 2000, p. 156; du Toit, 2002; Cheuk & Dervin, 2010) and from Section 2.1.2.2 as the working definition of knowledge for this research:

- (1) Knowledge is the product of the interaction between the individuals within the organization as part of a socially created process of sense making.
- (2) Knowledge is situated within a particular domain. It is not just facts, but also direction, ideas, support, confirmation and connection with other people.
- (3) Knowledge is created, interpreted, disseminated, and displayed through activity.
- (4) Knowledge is personal and bounded by developmental capacity.
- (5) Knowledge is concerned with emancipation.

- (6) Knowledge pays attention to the analysis of power relations.

This is not to refute wholly the value of the positivistic approach. But it is not much help to this research if the usual treatment on knowledge as vague and hard to pin down is still used. In view of the literature review of epistemology, the complex nature of knowledge, the limitations of positivism and the needs of this research to investigate knowledge creation, sharing and utilization in the healthcare field, an interpretive approach supplemented by critical inquiry to explore power relationships is deemed appropriate.

2.1.4 Definition of Knowledge Management

KM is often claimed as an oxymoron (Skyrme, 1997b; 2003) and knowledge and management are odd couples that should not be put together (Alevsson & Karreman, 2001). This alludes to whether knowledge is manageable. Wilson (2002) concluded from his voluminous literature review that knowledge cannot be managed and KM is a “nonsense” concept. In the positivistic approach, it has been clarified above that various ICT tools such as networks and databases are available to manage codifiable knowledge (Sutton, 2001). KM is not an oxymoron in this regard. On the contrary, in the constructionist / critical inquiry perspective, the answer to the question depends on how the term “management” is defined. If it is defined in the traditional or stronger sense to mean planning, organizing, leading and controlling, then knowledge is not manageable because to the constructionists, knowledge is highly personal and sometimes we do not know what we know. On the contrary, if a weaker form of management is taken such as the one suggested by Alevsson and Karreman (2001), which stresses more on coordination and facilitation, then KM is again not an oxymoron. In fact, the shift to this weaker form of management not only recognizes the fluid and tacit nature of knowledge which cannot be captured in any concrete sense but also the importance

of nurturing an environment to allow knowledge to grow and flourish. This meaning of management makes KM more sensible and thus it is adopted in this research. KM is henceforth defined as any activity to provide an environment conducive to or to facilitate the creation, sharing and utilization of knowledge at both individual and organizational levels.

In sum, the fuzziness and ambiguity of the concept of knowledge is acknowledged in the review of epistemology. From a mainly propositional concept in the Greek age, the knowledge concept has evolved gradually into many different faces and dimensions in contemporary times with the addition of elements of interaction, communication, action, and subjectivity. It is increasingly popular to favor the interpretive and critical inquiry perspectives to study and explore the characteristics of knowledge which is more widely recognized to be highly personal, contextualized, social, and situated in a particular time space. The sense-making theories that encompass myriads of interpretive and critical inquiry thinking stand out as the most appropriate approach to derive the main components of knowledge and the definition of KM. It should also be noted that though knowledge is not to be managed in the traditional sense, understanding how it is created at different ontological levels is still the first step in enabling the concept to blossom in organizations. The next two sections are a review of the major knowledge creation models based on the same interpretive and critical inquiry perspectives and how individual knowledge is linked with the organizational knowledge.

2.2 Review of Knowledge Creation Models

There is a rich collection of literature on knowledge creation models (Abou-Zeid, 2002; Dalkir, 2010; Despres & Chauvel, 2000; Jerram, 2004; Kim, 2001; McAdam & McCreedy, 1999a; 1999b; 2000; Wickramasinghe, 2008). As early as 1991, Nonaka (1991) has put

forward his famous SECI model of knowledge creation. Thereafter, it has become the mainstream theory in the literature; many others just model after it though some take a different approach (Hedlund, 1994; Boisot, 1995; Choo, 1998; Carayannis, 1999; Inukshuk, 2005). However, none of these models formulate a complete theory to fully explain the process of knowledge creation in organizations. This section will go through these major models with particular reference to their problems. The gaps in the research will then be identified.

2.2.1 Nonaka's SECI Model

The knowledge creation theory espoused by Nonaka in 1991 as the strategy for KM and the famous knowledge creation model announced in 1995 (Nonaka & Takeuchi, 1995) with subsequent modifications contributed by his close allies (Nonaka & Konno, 1998; Nonaka, Toyama & Konno, 2000; von Krogh, Ishijo & Nonaka, 2000; Nonaka & Toyama, 2003; Nonaka, Toyama & Hirata, 2008), are best exemplified in the SECI framework in Figure 2.6 below. Its core concept is that “knowledge creation is a synthesizing process through which an organization interacts with individuals and the environment to transcend emerging contradictions that the organization faces. This interconnection between agents and the structure makes the knowledge process occur as a dynamic and inter-linked interaction from an individual-to-societal level” (Nonaka & Toyama, 2003, p. 3).

The model rests on the premise of two dimensions of knowledge, one is epistemological and one is ontological. On the epistemological dimension, it is assumed that new knowledge is created from continuous social interaction of tacit and explicit knowledge resulting in four different modes of knowledge creation (Nonaka & Takeuchi, 1995, p. 61; Nonaka, Toyama & Hirata, 2008, p.18). As reiterated in previous sections of this Chapter, Nonaka's definitions

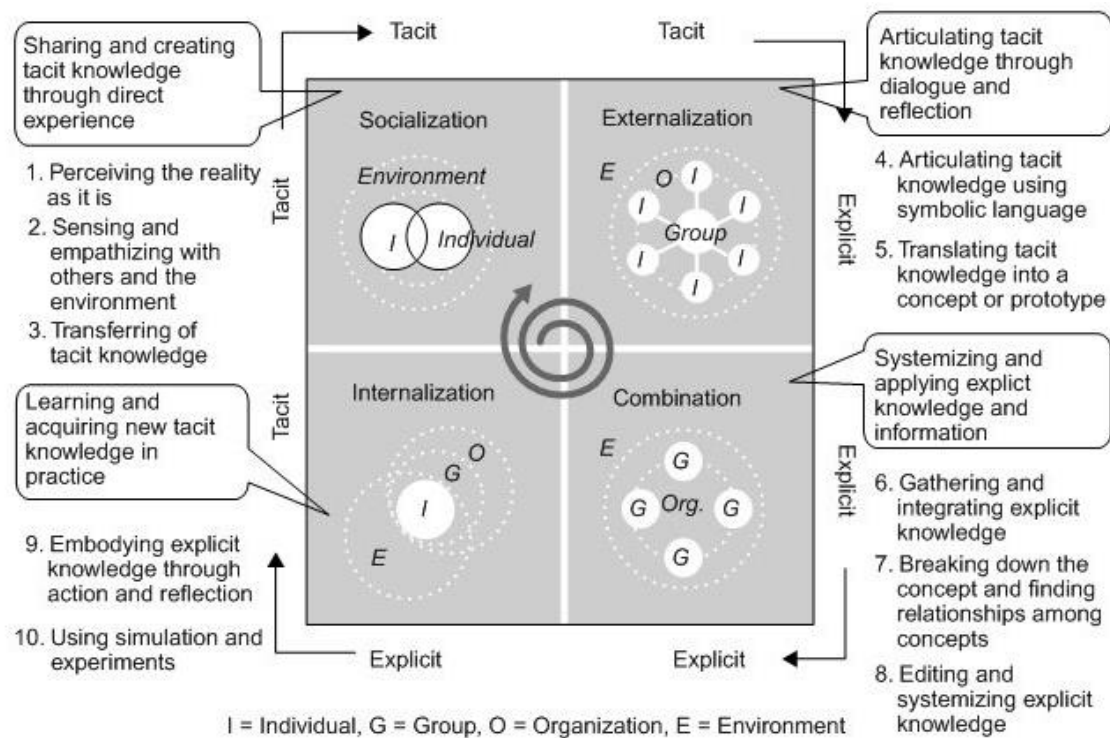


Figure 2.6 The Knowledge-creating Process: SECI model (Nonaka, Toyama & Hirata, 2008, p. 19)

of tacit and explicit knowledge are taken from Polanyi, yet without providing any explanation, he added a practical direction to expand Polanyi's tacit knowledge conception to include cognitive and technical elements. He further assumed tacit and explicit knowledge are two separate types of knowledge and entities. On the ontological dimension, Nonaka (1998) said, "New knowledge always begins with the individual" and "making personal knowledge available to others is the central activity of the knowledge-creating company" (p. 26). That is, the micro (individual) and the macro (environment) interact with each other, and changes occur at both levels so that the firm as a whole is capable of creating new knowledge, disseminating it throughout the whole organization and embodying it in products, services and systems (Nonaka & Takeuchi, 1995, p.3; Nonaka, Toyama & Konno, 2000, p. 8). Together with the epistemological dimension, organizational knowledge is created in four modes of knowledge conversion in an evolving *Ba*: socialization (S), externalization (E),

combination (C) and internalization (I). The process begins with socialization in which an individual's tacit knowledge (micro level) is shared with other individuals (micro level) in the same organization through shared experience in day-to-day social interaction to create new tacit knowledge. These shared direct experiences can be acquired through the traditional apprenticeship where apprentices learn through observation, imitation and practice. This is followed by articulating tacit knowledge of individuals (micro level) into explicit knowledge for the group (macro level) through the process of externalization. Here, dialectical dialogue taking the mode of metaphors, analogies, concepts, hypotheses or models is a powerful method to convert one's tacit knowledge that is difficult to express into the formal language of explicit knowledge. Through dialogues among individuals, contradictions between one's tacit knowledge and the structure, or contradictions among tacit knowledge of individuals are made explicit and synthesized (Nonaka & Toyama, 2003, p. 5). Explicit knowledge collected within the group (macro level) is then combined or processed into more complex and systematic sets of explicit knowledge that permeates over the whole organization (macro level). This stage is assisted by the creative use of computerized communication, networks and large-scale databases to capture externalized knowledge; disseminate it to the organization through presentations or meetings and edit it to turn it into reports or market data so that they are more usable (Nonaka & Konno, 1998, p. 45). Formal education and training at schools are also included. Finally, the explicit knowledge of the organization (macro level) in the combination stage is internalized into an individual's own tacit knowledge (micro level) when the explicit knowledge is actualized through action, practice and reflection. One often used example is learning by doing. Training programs can help trainees understand an organization and themselves. By reading documents or manuals, trainees can also internalize the explicit knowledge embedded in those documents. In a nutshell, through the continuous dynamic interactions between tacit and explicit knowledge

in the above four modes, knowledge is moved back and forth through the subjective (tacit knowledge) to the objective (explicit knowledge) to synthesize the contradictions revealed to form a spiral that will move upward from the micro individual level to the collective group level and then to the macro organizational level to create organizational knowledge (Nonaka, 1994, p. 20). The spiral will become larger in scale and faster in speed as more actors in and around the organization become involved.

To enable the knowledge spiral to function effectively in a knowledge-creating firm, Nonaka, Toyama and Hirata (2008) had developed a new process model as shown in Figure 2.7 after years of theoretical exploration and empirical examination. Inspired by the process philosophy of Whitehead (1925), these scholars believe that knowledge is process-relational. Every world experience is momentary that occurs at a particular time and space. Knowledge is not just about knowing but also affects and is affected by the environment at all times (Edwards, 2009, p. 113). Therefore, the human is always in the state of *becoming*. Applying to organizational knowledge creation, it means that firms are in the constant state of *becoming*. They will synthesize the past and present events to transcend their own boundaries and realize their vision of the future. As a result, they change themselves and others, the organization and the environment (Nonaka, Toyama & Hirata, 2008, p. 11). In this model, firms have to realize their own business ecosystem at a particular time-space to put forward appropriate knowledge vision and driving objectives as the direction and energy for the SECI process to create, share and utilize knowledge in the shared context of *Ba* which evolves with the organization. The firm in turn needs an effective knowledge strategy to manage this complex nature of knowledge. Nonaka encourages the cultivation of *phronesis* or practical ability to make timely value judgments in each particular situation at every level of the organization to provide distributed leadership that accelerates knowledge creation.

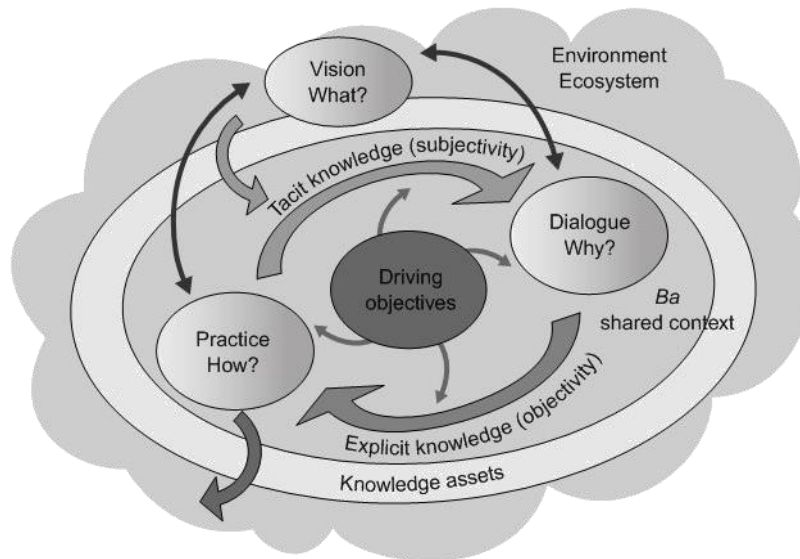


Figure 2.7 A Process Model of the Knowledge-based Firm (Nonaka, Toyama & Hirata, 2008, p. 27)

Despite its widespread influence and impact on the KM circle, the SECI model contains a number of pitfalls that prevent its efforts to become a fully dynamic and comprehensive framework. Nonaka's view of knowledge is criticized as erroneous and often called into question (Tsoukas, 1996; Cook & Brown, 1999; Tsoukas & Vladimirou, 2001). On the one hand, the view that knowledge is subjective, dynamic to be created in social interactions amongst individuals and organizations, and context-specific depending on a particular time and space, corresponds to the interpretivist's line of thoughts and my view on characteristics of knowledge (Nonaka, Toyama & Konno, 2000, p. 7). On the other hand, his definitions of tacit and explicit knowledge reveal many traces of positivism that are in stark contrast to that of Polanyi, who has not treated tacit and explicit knowledge as two separate entities. Though this was later clarified that tacit and explicit knowledge exist in a continuum in a mutually complementary manner and their relations are similar to the visible and submerged portions of an iceberg (Nonaka & von Krogh, 2009), this has not changed the assumptions of his theory much. The contradiction of employing a mixed ontology, trying to be both a

constructivist and a positivist, as Yolles (2000, p. 1215) commented, is where he diverges from Polanyi. Stenmark (2002, p. 932) even asserted that should Nonaka use the term implicit knowledge instead of tacit knowledge, there would be less confusion. A similar remark was also raised by Wallace (2007) who said, “Their use of tacit knowledge and explicit knowledge is so divergent from the views of Polanyi that the use of those terms is more a distraction than a strength” (p. 33). A number of other scholars directly pointed out that the knowledge conversion matrix was ultimately flawed in its present form (Gourlay, 2000; Gourlay & Nurse, 2005; Hildreth & Kimble, 2002). On the one hand, Nonaka and Takeuchi (1995) admitted that tacit knowledge is created through interpersonal interaction and thus is not transmissible through words. On the other hand, they also explained that the transfer of tacit knowledge can be accomplished by other different processes such as talking and reading (Nonaka & Takeuchi 1995, p.9). This implies that at least one form of tacit knowledge, the cognitive form, can be articulated but this already renders it as explicit, not tacit, knowledge. The ambiguity of concept lies in the fact that once it was agreed that tacit knowledge is by definition not expressible in words and is an irreducible aspect of all knowing, the tacit to tacit knowledge transfer through words becomes questionable (Gourlay, 2000). Furthermore, if tacit knowledge is inarticulable, it also makes the tacit to explicit conversion not workable at all. Yet, ironically, the primary KM approach to managing 'less-structured' knowledge is to try to make tacit knowledge explicit (Hildreth & Kimble, 2002). The whole idea to portray relationship of tacit and explicit knowledge through a matrix or to describe them as an interaction between opposite poles simply does not make any sense (Gourlay & Nurse, 2005, p. 303)

Another hotly debated issue is whether the four modes of knowledge conversion are sustainable. Gourlay (2003; 2006) argued ferociously that Nonaka’s proposition of

knowledge being created through the four modes of knowledge conversion is flawed empirically and conceptually. Empirically, no unambiguous evidence was found to support all four modes of operation. The case studies only provided tentative support for externalization; combination and internalization have not been clearly described, and socialization was not realistic as people can learn new skills without direct personal contact. Much of the 1993 survey data and case studies used by Nonaka actually came from earlier studies of semantic information creation, thus his theory so developed was at best be regarded as information creation rather than knowledge creation (Gourlay, 2003; Gourlay & Nurse, 2005). Even so, it only provides support for socialization and combination but the latter is conceptually incoherent. Conceptually, it is not clear enough to explain why knowledge creation has to begin with socialization, as it is always possible for new tacit knowledge to be created by internalization such as reading the documents of the company. This is exactly what is stated in Figure 2.6 that tacit knowledge can be created in both socialization and internalization modes. In fact, combination and externalization could also be the starting point of knowledge creation since “all that is required is that some ‘source’ activity, and thus associated tacit knowledge, already exists” (p. 1421). In addition, as identified by Stacey (2001, p. 18), the focus of the socialization mode is on transferring tacit knowledge from one person to another; it does not explain completely how new tacit knowledge comes to arise in individual heads. The failure to explain why the cycle starts from the point where some individuals already possess important tacit knowledge is the chief limitation of Nonaka’s approach. This was echoed by Bereiter (2002, pp. 175 – 179) who also pointed out the fact that Nonaka’s model does not explain how new ideas are produced, or how depth of understanding (necessary for expertise) develops.

Other scholars (McAdam & McCreedy, 1999a; 1999b; Griffin, Shaw, & Stacey, 1999; Venters, 2001) thought that the SECI approach failed to capture the complexity and convolution inherent in knowledge creation process. The problem lies in Nonaka's interpretation of self-organization. He argues that knowledge is created and expanded through the social interaction between tacit and explicit knowledge, and the knowledge spiral is driven by organizational intention, which is defined as an organization's aspiration to its goals. But he fails to take up Polanyi's concept to describe the interrelatedness of the tacit and explicit from within the act of meaning. Instead, he "subordinated both Polanyi's concept of tacit knowledge as a theory of practice and the principle of self-organization to a theory of strategic management as an objective science, whereby there is no discussion of the self-organization that gave rise to explicitly stated overriding goals" (Griffin, Shaw & Stacey, 1999, p. 300). As a result, he separated organizational intention from the relational context of self-organization. Without appreciating human organizations as complex network of relationships, Griffin, Shaw, and Stacey (1999, p. 295) criticized that he simply espoused a concept of leadership that stressed a desire to *use or manage* self-organizing processes as an instrument for gaining competitive advantage; and a desire to subsume the potentially more radical implications of self-organization and emergence within the current paradigm of objective management foresight and control.

Another major shortcoming of the SECI model is its weakness in illustrating how individual knowledge could become organizational. Despite the argument of the spiral theory that is supposed to move individual knowledge to the organizational level if individuals act upon their knowledge, Jakubik (2007, p. 9) found that it was still unknown how this was happening. McLean (2004) also concurred that owing to the highly abstract nature of the subject matter, the concepts presented in the SECI model lack explicit and testable hypotheses to show how

they relate to each other or operationalized. How one's knowledge can permeate the whole organization is the crux of the organizational knowledge creation theory. The SECI model fails itself in its inability to provide a clear and workable mechanism.

Finally, scholars are concerned about the limited applicability of the SECI model because it is based upon social and organizational characteristics that are specific to Japan and thus may not transfer to other contexts. For instance, the operation of the socialization model relies on a strong personal commitment to the organization and externalization mode is characterized by a Japanese group orientation (Dalkir, 2010, p. 3140). Since different countries and different industries have their own unique working culture, there is no assurance that the SECI model that may work effectively in a Japanese company can still be successful in a Chinese firm or another industry such as the healthcare sector.

Nonaka humbly admits that his theory “was not yet fully developed as a dynamic and comprehensive framework for managing the knowledge-based firm because we had not yet fully understood the characteristics of knowledge as a resource” (Nonaka, Toyama & Hirata, 2008, p. 241). Obviously, some important questions are still left unanswered. The model does not cover how individuals actually generate tacit knowledge (Spender, 1996a, p. 51); it concentrates on the transfer of tacit knowledge. The relationship between individual and organizational knowledge is still unclear (Jakubik, 2007, p. 9). These two questions are particularly important to this research and will be explored later. Chen and Huang (2012) further pointed out that the issues of how knowledge creation takes place in different contexts, such as the newly start-up or the small and medium firms, and how the individual building blocks presented in Nonaka, Toyama and Konno (2000) and Nonaka and Toyama (2003, 2005) can be quantified and analyzed, still await further examining. Nonetheless, the model

does contribute to the advancement of KM theory. It is the first framework to focus on organizational knowledge creation by bringing in epistemological and ontological dimensions of knowledge, though the question of how individual knowledge is linked to organizational knowledge is still found wanting. His concept of tacit knowledge is tightly linked to phenomenological epistemology (Nishitani, 1991). It is contradictory to readers to find positivistic ideas such as categorization of knowledge in this major interpretivistic stance. It is also notable that there are some traces of sense-making theories of Dervin and Weick in Nonaka's ideas. The most obvious of which is Nonaka's emphasis on the process-relational characteristic of knowledge and that every world experience is momentary, that occurs at a particular time and space. Knowledge becomes a flow rather than a stock. The essence of the environment, the particular context of *Ba*, and past events and future vision of the organization on knowledge creation are also similar to Weick's.

2.2.2 Hedlund's N-Form Organization

Hedlund's N-Form model was proposed in 1994, right after his work with Nonaka (Hedlund & Nonaka, 1993) and well before Nonaka and Takeuchi's works (1995). While it is generally said that the N-Form model is a more elaborate version of Nonaka's (McAdam & McCreedy, 1999a; Haslinda & Sarinah, 2009), it is not a reaction to Nonaka's KM spiral though some similar traces of ideas can be identified. In the words of Hedlund (1994, p. 82), the model is to capture "important differences between Western and Japanese approaches to knowledge management in large firms" in order to present the most possible and desirable framework for the process of knowledge storage, transfer and transformation in organizations. It is argued that it needs to go beyond the traditional M-Form (multidivisional form) hierarchical corporation to build on the interplay between two different types of knowledge: articulated and tacit, at four different levels of carriers of knowledge: the individual, the small group,

the organization and the interorganizational domain, under three sets of dynamic processes: articulation and internalization, the interaction of which is called reflection; extension and appropriation, the interaction of which is dialogue; and assimilation and dissemination. These elements are all displayed in Table 2.5 and Figure 2.8 below to clarify how inputs of knowledge (can be both articulated and tacit) are injected into the organization (assimilation) to invoke different processes (articulation, internalization, reflection, extension, appropriation, dialogue) to transfer and transform its nature in a dynamic way from the lowest individual to the highest interorganizational domain level to become outputs (can be both articulated and tacit) that can be disseminated to the environment (dissemination). Of these different processes, reflection is considered the primary source of knowledge creation.

Table 2.5 **Types, Forms and Levels of Knowledge** (Hedlund, 1994, p. 75)

	Individual	Group	Organization	Interorganizational Domain
Articulated Knowledge / Information Cognitive Skills Embodied	Knowledge calculus	Quality circle's documental analysis of its performance	Organization chart	Suppliers' patents and documented practices
Tacit knowledge / Information Cognitive Skills Embodied	Cross-cultural negotiation skills	Team coordination in complex work	Corporate culture	Customers' attitudes to products and expectations

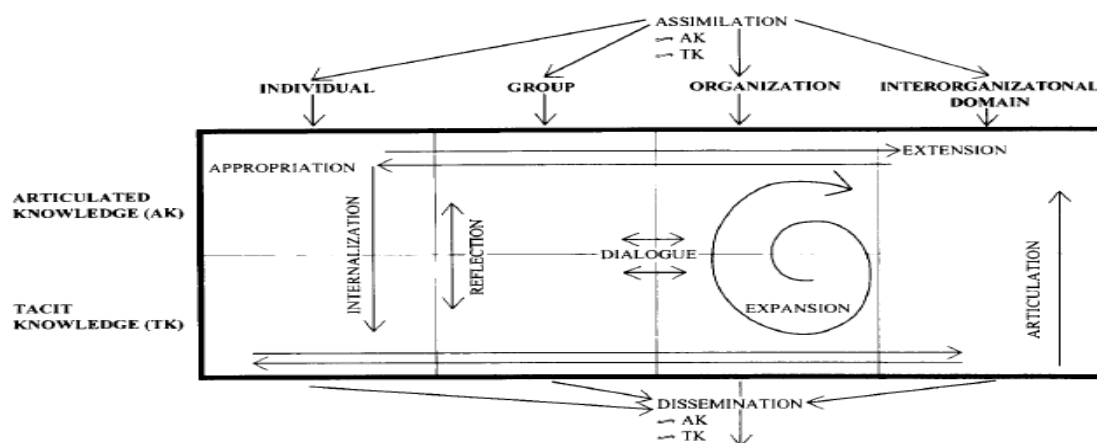


Figure 2.8 **Hedlund's N-Form Organization and Transformation Processes** (Hedlund, 1994, p. 77)

It is undeniable that the model is more sophisticated than the SECI model in capturing the complexity of knowledge transfer and transformation in organizations. However, it remains problematic (albeit limited) in that it assumes the carriers, like the knowledge, can be simply segregated and related with the limited types of knowledge (Table 2.5), which is consistent with Nonaka's externalization and combination KM process (McAdam & McCreedy, 1999a, p. 96; Haslinda & Sarinah, p. 2009, p. 190). Besides having the same typological categorizations as Nonaka's, Hedlund's model is never a knowledge creation model. He did give a few examples of reflection such as writing a good scientific paper, but he never went beyond that to elaborate clearly what the process is. It is more a knowledge transfer and transformation model than one for knowledge creation.

2.2.3 Boisot's I-Space Model

Boisot's (1998) I-Space model is built on his perspectives on the relations amongst data, information and knowledge. Data is something out there that an observer notices. Information is what is extracted from data when incoming data can be related in a meaningful way to an observer's prior expectations. Knowledge is what the observer believes that dispose him or her to act on the receipt of new information and it is subject to modification by information extracted from data (Boisot & Griffiths, 2001, p. 214). In other words, in Boisot's model, it is only data, instead of information or knowledge as Nonaka claimed, that will flow within an organization, but one will come to sense the presence of knowledge by tracking the flow of physical data. The question then becomes how data is moved in the I-Space.

As shown in Figure 2.9 below, the I-Space model is presented as a three-dimensional cube with three axes: codification, abstraction and diffusion. The basic tenet of the model is "The

more codified and abstract an item of information becomes, then, other things being equal, the larger the percentage of a given population it will be able to reach in a given period of time” (Boisot, 1998, p. 55). Codification refers to the creation of content categories to which data can be readily assigned for further processing (Boisot & Griffiths, 2001, p. 215). It is similar to the tacit-explicit dichotomy of Nonaka’s SECI model in that knowledge is either codified or uncoded. But Boisot brings in an extra dimension of abstraction to the SECI model to explain the mechanism of knowledge sharing. Abstraction is the process that minimizes the number of cognitive categories an agent needs to make sense of events. The fewer the categories an agent needs to understand the events, the more abstract the data is. Since codification lend structure and order to the process of abstraction, which in turn, by establishing categories that are relevant to an agent’s purpose, channels efforts at codification into useful, meaningful areas, both processes work together to speed up the diffusion of data within an organization (Boisot & Griffiths, 2001, p. 215). And the more easily the data can be diffused, the more amenable they are to sharing. Rather than restricting the acquisition of shared experience through apprenticeship as espoused in the socialization mode of Nonaka, Boisot emphasizes the need for a common context for knowledge sharing to take place.

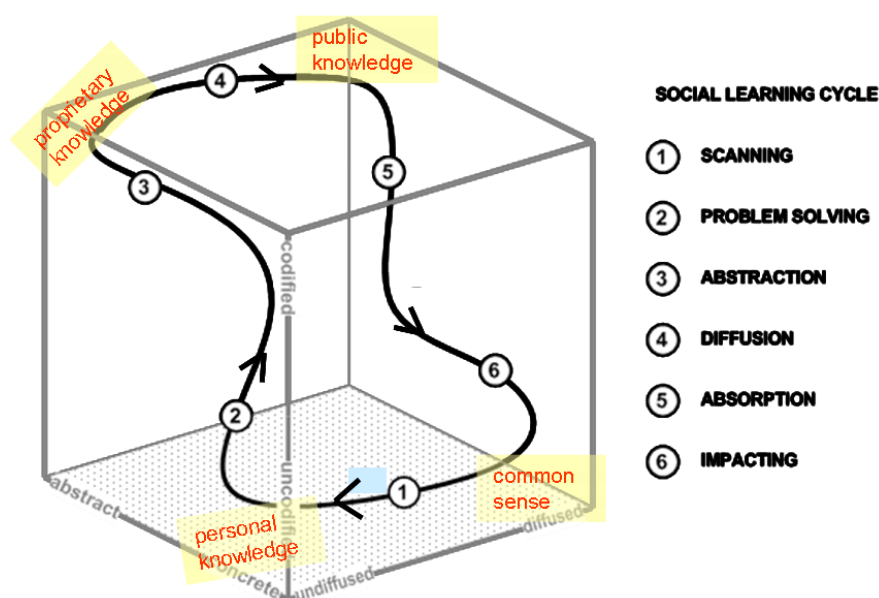


Figure 2.9 Boisot’s I-Space Model (Adapted from Boisot & Griffiths, 2001, p. 217)

Another new concept explicit in the I-Space is the element of learning in the generation of new knowledge. This has not been directly addressed by other knowledge creation models. Boisot calls the most discernible flow pattern of data as the Social Learning Cycle (SLC) that moves data clockwise cyclically in the I-Space in the consecutive order of the following six phases (Figure 2.9). This reflects not only the creation, distribution, and absorption of new knowledge but also the learning processes of a given population (Boisot, 1995, p. 187).

- *Scanning*: insights are gained from generally available (diffused) data
- *Problem-Solving*: problems are solved giving structure and coherence to these insights (knowledge becomes codified)
- *Abstraction*: the newly codified insights are generalized to a wide range of situations (knowledge becomes more abstract)
- *Diffusion*: the new insights are shared with a target population in a codified and abstract form (knowledge becomes diffused)
- *Absorption*: the newly codified insights are applied to a variety of situations producing new learning experiences (knowledge is absorbed and produces learnt behavior and so becomes uncoded, or tacit)
- *Impacting*: abstract knowledge becomes embedded in concrete practices, for example in artifacts, rules or behavior patterns (knowledge becomes concrete)

Following Polanyi and Dervin, Boisot is another scholar to put forward learning as the means to acquire new knowledge or drop old knowledge in its SLC. Starting from the fuzzy “personal knowledge” which is highly uncoded, concrete and therefore hard to be diffused, people in the organization need to extract novel pattern from the data before moving the cycle upwards towards more codified and abstract to become “proprietary knowledge”. Here, Boisot introduces the processes of scanning, problem-solving and abstraction as knowledge

creation activities. People have to make use of their own imagination and independent thought to identify any new pattern from the data. The findings must be subject to further testing for their robustness. Boisot calls this process problem-solving, which may include alternatives identification, scientific discovery, assimilation, accommodation and heuristic problem-solving. After rigorous testing and selecting the best fit, the data pattern will gradually become more codified and articulated, and thus can be generalized to different situations. This process of abstraction “produces a richer scheme allowing the flow and transformation of knowledge to be analyzed in a greater detail” (Haggie & Kingston, 2003). This first part of SLC gives a clearer picture of how new knowledge is created by the process of learning and how tacit knowledge is converted into explicit knowledge.

The second part of SLC covers knowledge sharing. Proprietary knowledge can be regarded as explicit knowledge in the SECI model. Being more codified and abstract, it is ready for more widespread diffusion and sharing by more people with the help of ICTs to become “public knowledge”. At the same time, people will absorb external knowledge and get assimilated with their internal schema. Boisot (2002, p. 73) states that it is a process of internalization and sensemaking in which new information is integrated with an existing knowledge base. Finally, such knowledge will be embedded in practice to become “common sense” in which knowledge will move back to its uncoded and concrete state.

Many valuable insights are offered by Boisot’s model. It recognizes the elusive and dynamic nature of knowledge. Knowledge is not a thing out there, but an extraction from relevant information and meaningful data. Consequently, we are told that knowledge can be applied in diverse situations. It is the first model that incorporates learning as the key factor contributing to the creation and transmission of knowledge within an organization. This

provides an important direction for future research. As Dalkir (2005, p. 66) commented, the SLC serves to link content, information, and KM in a very effective way - the codification dimension is linked to categorization and classification; the abstraction dimension is linked to knowledge creation, and the diffusion dimension is linked to information access and transfer. Therefore, the model presents much potential to be used to manage an organization's knowledge assets. It is also the first time to see notions of problem-solving and sensemaking in a knowledge creation model. More sensemaking knowledge creation models are developed thereafter and will be reviewed later. Yet, the I-Space model has many shortcomings too that need further elaboration before they can be applied in this research. McAdam and McCreedy (1999a, p. 97) pointed out it suffers from the same limitations as Nonaka's SECI model in that knowledge is categorized into discrete types and is thus more consistent with the positivistic approach. The idea of diffused knowledge is also rather general and lack clarity if it includes incorporating knowledge within the organization or the idea of spreading it. In addition, the paths, media as well as the diffusion process are still left unexplored. Dalkir (2005, pp. 66 – 67) summarized that the model is so narrowly implemented that more extensive field-testing of its applicability is required.

2.2.4 Demerest's Knowledge Construction Model

Adapted from Clarke and Staunton's (1989) model of KM, Demerest's model lays emphasis on the social construction of knowledge. As seen from Figure 2.10 below, the constructed knowledge is then embodied within the organization through a process of social interchange. This is then followed by dissemination and being put to economic use. There is also bi-directional flow of knowledge amongst these processes. McAdam and McCreedy (1999a; 1999b; 2000) commented that as compared to knowledge categorization models, Demerest's model takes a more holistic approach to knowledge construction rather than assuming any

given definition of knowledge. It is intrinsically linked to the social and learning processes within the organization. It is also similar to other models which include knowledge acquisition, problem solving, dissemination, ownership, storage, knowledge policy, systems knowledge and communities of practice. However, the model implies a simplistic procedural and mechanistic approach; it ignores the fact that the flow of knowledge in organizations is extremely complex, rapid and circulatory, as in the case of action learning. Moreover, there is no detailed mechanism of how knowledge is actually constructed or created.

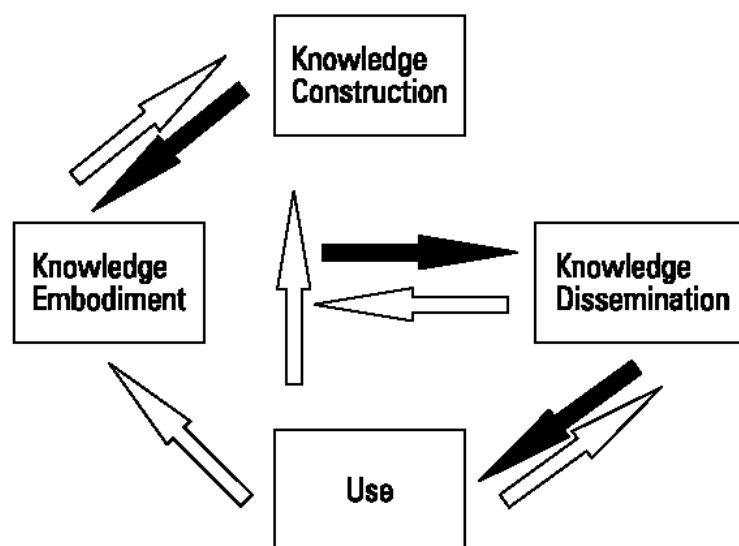


Figure 2.10 Demerest's Knowledge Construction Model (McAdam & McCreedy, 2000, p. 157)

2.2.5 Choo's Sense-Making Model

The concept of sensemaking is formally introduced in Choo's (1998; 2006) KM model. In addition to the component of sensemaking, it also includes two other processes of knowledge creating and decision making. Huotari (2010) provided a succinct review of Choo's model:

Chun Wei Choo has applied Taylor's model of information use environments, Dervin's situation-gap-model of sense-making, and Kuhlthau's information search process, which includes the affective dimension, to a general model of information

use within organizational settings... He presents three platforms, where organizations use information: to make sense of the environment in which they operate, to create or generate new knowledge through organizational learning, and to make decisions on the basis on the principle of bounded rationality. These interconnected processes shape a holistic view of organizational information use, and integration of the three platforms constitutes a knowing organization. (pp. 3109- 3310)

The central idea behind Choo's model shown in Figure 2.11 below is to "present an information-based view of organizations, a model of how organizations use information to adapt to external change and to foster internal growth" (Choo, 2006, p. 1). Sense-making is triggered by a change in the external environment. In response to the change, members of the organization have to make sense of the new information flow from the environment in order to construct shared meanings that define the organization's purpose and frame the perception of problems or opportunities that the organization can work on, and which also provide a shared context for creating new knowledge and making decisions for actions (Choo, 2002, p. 79). How sensemaking is performed is based on Weick's (1995; 2001) model of organizational sensemaking, which is built on four interconnected processes of ecological change, enactment, selection and retention. Ecological change refers to changes in the environment that create discontinuity in the experience of the organizational members who then need to find ways to interpret or make sense of the information to reduce its equivocality so as to derive shared meanings. Enactment is such a process to construct the environment by bracketing experiences and creating new features in the environment so as to form a smaller set of equivocal data to be interpreted. Based on organizational members' past interpretations that worked well before in explaining similar or related situations with the equivocal data, the one that provides the most sensible cause-effect explanation of what the current situation is selected. In retention, all successful sensmaking experience will be

retained to create an organizational memory that can be retrieved for future cycles of enactment and selection.

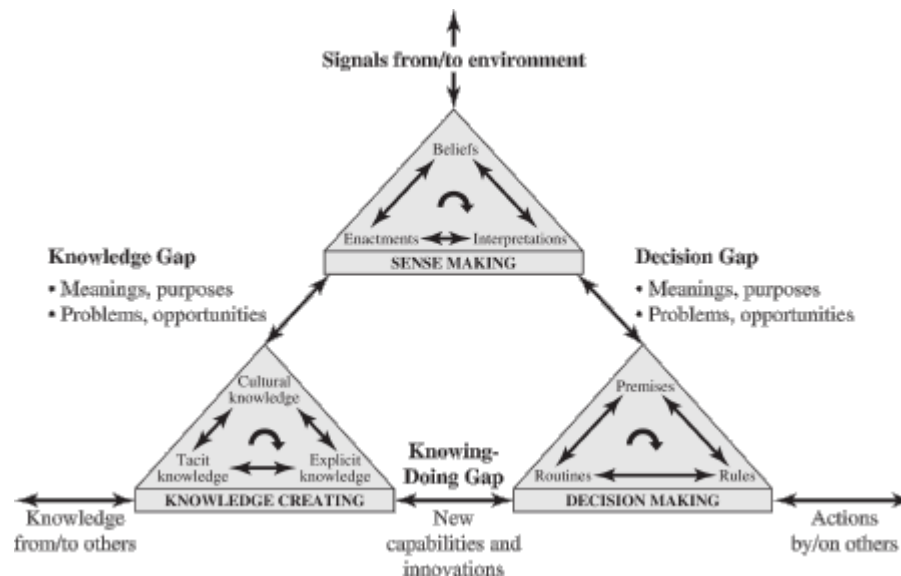


Figure 2.11 Choo's Sensemaking Model (Choo, 2006, p. 250)

The above sensemaking activities are affected by organizational members' beliefs and actions. Both combine to determine how people select, highlight and connect events, and enact new features to help them understand the environment (Choo, 2006, p. 18). As said, the outcome of sensemaking is a shared context for knowledge creating and decision making. Knowledge creation can be perceived as a transformation of personal experiences into knowledge through dialogue, discourse, sharing and storytelling. It occurs when the organization faces a new problem situation that has never been encountered before and, in order to close the knowledge gap that exists, it needs to embark on knowledge creation to generate the knowledge it is lacking to solve the problem. While sensemaking is information interpretation, knowledge creation is information conversion. In Choo's view, there are three types of knowledge. They are tacit, explicit and cultural. Knowledge creation incorporates the SECI knowledge conversion model of Nonaka, the knowledge building of Leonard-

Barton (1995) and knowledge-linking of Normann and Ramirez (1994). Through these processes, Choo argues that the organization will continuously create new knowledge by converting tacit to explicit knowledge; building up knowledge through shared problem solving, experimenting and prototyping that in the end will strengthen the organization's distinctive core capabilities; and transferring knowledge across its own boundaries to form close learning alliance with other organizations. The result of knowledge creation can be new capabilities or innovations that give more options for the organization to make more informed decisions.

The strength of Choo's model is in taking a holistic approach towards key processes of KM with extension to organizational decision making, which is often lacking in many other KM models (Dalkir, 2005, p. 61; 2010, p. 3141; Huotari, 2010, p. 3112). It also includes many useful concepts such as knowledge building methods of problem-solving and improvisations which can be further developed. The model is also valuable in its incorporation of the concept of "sensemaking", focusing on how individuals must make sense, or develop understanding, of the knowledge that is available in the organization. It lays down clearly that sensemaking plays an important role in facilitating the creation of organizational knowledge and decision-making.

However, the focus of the model is on information management, not KM. As sensemaking is obviously an interpretivist's concept, it is contradictory for Choo to adopt the positivist's approach to categorize knowledge into discrete types. In addition, some also comment that the assumption of the model that organizations can learn and acquire knowledge is not tenable; only humans working in organizations are capable of learning and knowing (Wilson,

2007). Although this is a very good and comprehensive model with numerous valuable concepts, further modification is still needed.

2.2.6 Cecez-Keemanovic's Sensemaking model

The sensemaking concept is more fully adopted in Cecez-Kecmanovic's (2002; 2004) model. Drawing on Wiley's (1988)'s micro-macro social theory, Weick's (1995; 2001) sensemaking model and Tsoukas's (1996) view of firms as distributed knowledge systems, Cecez-Kecmanovic's (2004) sensemaking view of organizations "focuses on how people construct sense of their worlds and how they use and create knowledge in the process of sensemaking" (p. 157). Similar to Dervin's SMM, the process starts from encountering a puzzling or incomprehensible situation in which an individual has to interpret and assign meaning to it by drawing upon his or her own experience as well as his or her own background knowledge of a context within which the event occurred. New knowledge is thus created in this process of making sense by seeking and exchanging information, ascribing meaning, interpreting and explaining situations and determining an action. Cecez-Kecmanovic believed that organizations were described by Wiley (1988)'s four mutually interrelated levels of sensemaking: intrasubjective, intersubjective, generic subjective, and extrasubjective. Therefore, in his view, sensemaking process was carried out by different entities in these four levels creating different types of knowledge, namely, individual, inter-subjective or collective, organizational and cultural. These knowledge types are simultaneously created, transformed and applied in social practices and in permanent flux, influencing and reconstituting each other. They are graphically presented in Figure 2.12 below.



Figure 2.12 The Sensemaking Model of KM in Organization (Cecez-Kecmanovic & Jerram, 2002, p. 897)

Cecez-Kecmanovic has a similar view to Weick (1995) in that sensemaking is drawn from and based on knowledge, but also creates new knowledge. He also shares with Dervin's theory that the reality is socially constructed and whether individuals alone or in groups will achieve the same understanding and interpretation of an event or a situation, triggering a collective action. He thought it was important to distinguish and analyze different types of knowledge at a particular sensemaking level. It was also equally crucial to investigate the impacts of one level on the other such as the ways actors interact are determined by patterns of communication and organizational rules as part of social structure. He concluded that the sensemaking model of knowledge may assist organizations in understanding better their knowledge resources and problems associated with knowledge creation, sharing and deployment. However, he is not very specific of how knowledge is created in the sensemaking process in each level. For instance, the following is what Cecez-Kecmanovic (2004) described of the intra-subjective sensemaking:

At the basic intra-subjective sensemaking level, it is an individual who observes and interprets situations and events, makes sense of them and performs tasks by applying his/her experience, judgment and skills, that is, previously acquired knowledge. As a result, the individual learns and creates new knowledge. (p. 158)

Though some key concepts are raised such as individual observation, perception and interpretation, individual cognitive characteristics, individual training, he still fails to portray any specific process or mechanism for knowledge creation. Again, like many other knowledge creation models, the question of how individuals create knowledge is still left unanswered (Spender, 1996a, p. 51).

To conclude, I concur with the view of Evans and Alleyne (2009) that today, there is no known model that provides a comprehensive view of the elements and processes involved in knowledge creation, and “existing models of the knowledge domain attempt to model only parts of the environment (e.g., Nonaka and Takeuchi’s (1995) SECI Model; Boisot’s (1998) Data, Information, Knowledge; and Reilly’s (2008) Relational Knowledge Domain Model)” (p. 148). What emerges from these models is the clear interpretivist stance they take in recognizing the social character of knowledge though it is also contradictory for them to categorize knowledge into different entities and mistaken for them to use tacit and explicit knowledge in the belief that they are separate entities. But one important characteristic emerged from these models is the variation of traces of sensemaking theories. The claims abound that knowledge is usually created under turbulent change of the environment or when a puzzling situation is encountered. The critical importance of time-space concept and the situational character of knowledge are highlighted. In fact, Choo’s and Cecez-Kecmanovic’s models are based on Weick’s sensemaking theory and also draw on some of Dervin’s SMM. Souto, Dervin, and Savolainen (2012) directly pointed out the need to have designs that allow

the knowing workers to focus not just on delivering knowledge but also on communicating knowledge that will be contributive to intended users and supportive of the ways in which they create new knowledge. They provided an exemplar using Dervin's SMM as an approach to focus on how knowledge workers navigate complex and elusive situations and, in particular, on their knowing actions in specific moments of time-space within their situations, an approach that can attend systematically to time-space bound patterns of user knowings.

An ontological dimension can also be commonly found in nearly all models reviewed. It is argued that individual knowledge must spread around to the organization and even beyond its own organization through different ontological levels and in each of the stage, knowledge will be transformed. But the link between individual and organizational knowledge is not thoroughly studied and it is unclear about the micro-macro relationship in knowledge creation and sharing. Spencer's (2008) view below succinctly pinpointed the importance of conducting further research into these topics:

I strongly believe that the management and organization studies must begin to develop an understanding of the meta-cognitive and micro-interactional processes involved in these absolutely important phenomena. Without these understandings, practicing managers, the ultimate target of our knowledge building enterprise in the discipline, are less likely be able to make sense of their learning and knowledge building processes. ... I do not see these issues being holistically addressed in our journals and conferences, and one would certainly never find them addressed in any of our management textbooks. (p. 466)

The next section will review the current studies on the relationship between individual and organizational knowledge.

2.3 The Link between Individual and Organizational Knowledge

How individual knowledge is linked to organizational knowledge is concerned with the century-old question of whether individuals, groups, organizations or institutions are the cognizing entities. There are various schools of thoughts in the literature. The cognitive theory based on the positivist epistemology assumes that organizations are able to learn, either through individual members of the organization or by assuming that the organization has the same cognitive capacities as its members (Cybert & March, 1963; March & Olsen, 1975; Hedberg, 1981; Cohen, 1991; Simon, 1991; Dodgson, 1993; Kim, 1993). Organizational learning is thus linked to individual learning theories which are based on behaviorism or cognitivism. Behaviorism emphasizes the stimulus-response relationship that was espoused in Hedberg's (1981) model. Cognitivism assumes that the human mind functions like a computer. Kim's (1993) model that links individual and organizational learning through mental models has obviously taken the cognitive stance. Like learning, knowledge is regarded as a commodity that can be handled individually. Organizational knowledge is defined as the sum of individual knowledge or individual knowledge shared by all members of an organization. Grant's (1996) resource-based theory, Nelson and Winter's (1982) evolutionary theory and Nonaka and Takeuchi's (1995) SECI model are all regarded to have embraced the cognitive perspectives (Chiva & Alegre, 2006).

While many of the contemporary research on organizational learning and knowledge is basically positivistic (Spender, 1996b), they fail to provide "convincing explanations for the transition of the learning from an individual state to an organizational state" (Magalhaes, 1998, p. 111) and thus the link with organizational knowledge development. There are doubts over the beliefs that individuals and organizations were ontologically similar and the assumption that organization can learn and act like human beings (Cook & Yanow, 1996).

Hence, many theorists still believe that only individuals can think and learn. There is a lack of clarity about the relationship between thought and action, and thus about the dynamics of learning and forgetting at the organizational level (Spender, 1998a; Magalhaes, 1998). Another critical deficiency in this school of thought is the assumption that there is only one type of objective knowledge, effectively ignoring the fact that organizations are more likely than individuals to retrieve tacit components of knowledge in their daily social interaction (Spender, 1998a).

A gradual paradigm shift away from the positivist epistemologies to the interpretivist perspective is evident in an expanding body of research that takes a communicative approach in the understanding of individual and organizational knowledge. Peter Drucker (1954) was one of the first to regard communication as one of the key features of a Management-by-Objectives organization. Duncan and Weiss (1979) echoed this when arguing that organizational learning is a process of knowledge development and organizational knowledge emerges out of the social process of interaction of organizational members. This line of thought was developed further by Daft and Weick (1984) who viewed organizations as interpretation systems. They stated, “The distinctive feature of organization level information activity is sharing. A piece of data, a perception, a cognitive map is shared among managers who constitute the interpretation system” (Daft & Weick, 1984, p. 285). Weick and Roberts (1993)’s concept of collective mind further takes communication processes into the centre of the formation of group mind. Collective mind “is conceptualized as a pattern of heedful interrelations of actions in a social system. Actors in the system construct their actions (contributions), understanding that the system consists of connected actions by themselves and others (representation), and interrelate their actions within the system (subordination)” (Weick & Roberts, 1993, p. 357). Collective knowledge as derived

from collective mind is understood as an emergent capacity to act collectively, “involves continuous co-creation of inter-subjective meanings and mutual understanding through ‘heedful interrelating’” (Cecez-Kecmanovic, 2004, p. 158). It is different from individual knowledge in that it resides between rather than within individuals. Social interactions and patterns of interlocking behaviors among organizational members were placed as the key to link to organizational knowledge.

Weick and Roberts’ thoughts found a number of parallels in Maturana and Varela’s (1992) theory of autopoiesis, which also forms the basis of von Krogh and Roos (1996)’s self-referential epistemology. Autopoietic theory has its origin in biology to differentiate living from non-living organisms. Living systems are those that are capable of self-producing its own components in a bounded system in an autonomous manner. In other words, the self-produced components are necessary and sufficient to produce the system continuously and this auto-organization is “operationally closed” so that the system is also self-referential: it produces its own rules of existence and therefore has a particular type of “biological” coherence (Luisi, 2003; Hall, 2005; Hall & Noursala, 2010; Magalhães, 1998; Kay & Cecez-Kecmanovic, 2002; 2003). Drawing on Darwin’s concept of natural drift and the notions of structural coupling and structural determinism, the theory is applied to the understanding of cognition and organizational knowledge. Maturana (1970) defined “cognition” as the operation of organizationally closed network of processes:

A cognitive system is a system whose organization defines a domain of interactions in which it can act with relevance to the maintenance of itself, and the process of cognition is the actual (inductive) acting or behaving in this domain. Cognition in a self-sustaining system thus comprises homeostatic processes within the system

responding to perturbations in order to maintain the entity's capacity for self-maintenance and self-sustainment. (p.13)

When an individual interacts with the environment which only serves as the trigger for change or perturbation, his or her response is determined by particular states of his or her nervous system activity in a closed cycle or what is called structural determinism (Maturana & Varela, 1980). The person will experience the phenomenon of natural drift in which the person's behavior will change as the structure of his or her nervous system gradually changes to adapt to the change in the environment. The way an individual's behavior is changed is not only unique to that person but also is defined by that person's own history of interactions with the environment. In addition, both the person and the environment co-adapt to each other in the course of evolution (Maturana & Varela, 1992). By this notion of structural coupling in which there is mutual co-evolution of the environment and the person (enacting, or co-emergence) in a history of evolutionary transformation, it gives rise to the process of life, and simultaneously to the process of cognition (Luisi, 2003; Proulx, 2008). Kay and Cecez-Kecmanovic (2002) argued that this individual cognition is linked to organization knowledge through the concepts of structural coupling and consensual domains. When two or more autopoietic entities interact with each other in an organization and become recurrent, they are so structurally coupled that they become second-order autopoietic entities that exhibit a degree of structural congruence developed through their common experiences. The gradual structural coupling of two or more second-order autopoietic entities will establish a third-order social system (Maturana & Varela, 1980) and produces sets of contextual interlocking behaviors that will enable two individuals to observe the attribution of meaning to common events and experience that are extremely similar for both parties (Kay & Cecez-Kecmanovic, 2002, p. 385). These sets of interlocking behaviors is referred to as "consensual domains" or "coordinated behavior", which, according to Maturana and Varela (1992), is also

a kind of communicative behavior as “communication takes place each time there is coordinated behavior in a realm of structural coupling” (p. 196). Language is an example of this consensual domain. Based on the above premise, Magalhães (1998) argued that the autopoietic view of language use is one of the missing links between individual and organizational knowledge (p. 112).

The above co-ontogenous view of communication also denotes Maturana and Varela’s view on organizational knowledge. Taking the view that organizational knowledge exists through the development of consensual domains, and the view that cognition is not a representation of the pre-existing world, Maturana and Varela (1992) assert that there is an intimate relationship between human knowledge and human experience. Hence, “to live is to know” (Maturana & Varela, 1992, p. 174) and that “every act of knowing brings forth a world ... [such that] All doing is knowing and all knowing is doing” (Maturana & Varela, 1992, p. 26). They pointed out that a person’s knowledge is inseparable from how the world appears to him or her. Therefore, knowledge is context-dependent, is closely linked to observation, is not abstract, is effective action, is found in the mind, body and in the social system, and is shared through communication. It is clear that similar to the idea expressed in collective mind, autopoietic theory also recognizes the importance of interactions and activity in the development of coordinated behaviors.

Under the influence of Maturana and Varela, von Krogh and Roos (1995a) also argued that the bridge between individualized and socialized knowledge is achieved by means of language. In their view, while knowledge construction is a personal experience according to the theory of autopoiesis, how this individualized knowledge becomes socialized or organizational can be explained by the theory of scaling. Scaling implies self-similarity.

Applying to the emergence of organization knowledge, it means that “the way new knowledge is produced at the individual level is similar to the way new knowledge is produced at the group, the department and the organization levels” (Magalhães, 1998, p. 109). And behind the whole engine of this conversion is again language. The function of language is to allow action to be coordinated in the organization, and such coordination is achieved through organizational members making useful distinctions about the organization (an important form of organizational learning) (Magalhães & Sanchez, 2009, p. 9).

Although the theory of autopoiesis is applied in the understanding of social systems and organization science, it does not have a profound influence as the theory itself is not developed to account for social behaviors. Unlike von Krogh and Roos (1996), Goldspink and Kay (2004) did not consider social systems to be autopoietic. Instead, they found the theory useful for understanding the characteristics of the micro-level agents that make up social systems – human individuals and how social behavior can arise from, and is constrained by, the characteristics of human individuals (Goldspink & Kay, 2004, pp. 599 - 602). But this is not sufficient enough to explain the macro-level behavior. To them, a more complete framework that links both the constitutive (micro) and emergent (macro) dimensions of social organizations is the synthesis between autopoietic and complexity theory. Complexity theory provides a basis for understanding the range and type of dynamics possible at macro-level if individuals that make up the organization are brought together and begin to act in coordinated ways (Goldspink & Kay, 2004). The two theories are seen as compatible to each other for they present common epistemological and ontological roots in epistemological relativism and ontological realism which are consistent with the philosophy of critical realism. Complexity theory is later incorporated in Stacy’s (2001) complex response processes in organizations and forms the basis of Snowden’s (2000; 2002) Cynefin

model. The shift towards a communicative approach to link individual and organizational knowledge is so obvious that this thesis also adopts this kind of theory as the research lens.

Taking the above perspective of knowledge as a process and socially constructed, both Spender and Tsoukas lay more emphasis on the role of activity in organizations. In recognition of the weakness of Weick and Roberts's (1993) collective mind analysis in clarifying the relationship between the individual and collective mind, the source of knowledge received and how the collective learns (Spender, 1998a, pp. 20-21), Spender (1996b) attempted to develop a more comprehensive theory that covers a theory of learning, of memory and of knowledge application in the workplace. He looked to the actor network theory of Callon (1986) and Latour (1986), the activity theory of Vygotsky (1962) and the analysis of Reber (1993) to derive his conception of individual and social knowledge using explicit / implicit distinction in a two-by-two matrix (see Table 2.4 in p. 95 above). Each quadrant represents different types of organizational knowledge, learning and memory processes. They interact with each other dialectically to form an organic system with knowledge both at the level of the system and at the level of the individuals it embraces. Rather than as a system of tradable resources, the organization is re-conceptualized as a community of practice with situated and embedded knowledge and institutional dimensions that give these practices meaning. It presages the change of paradigm to those that focus on the social nature of meaning and practice and the resulting model is an organization with a dynamic and self-referring system (Spender, 1996b, p. 75). However, Spender (1998a) emphasizes that his model still awaits further testing for its validity and utility.

Drawing mainly from Polanyi's exposition that all knowledge is personal and Wittgenstein's theory that all knowledge is collective, Tsoukas and Vladimirou (2001) defined individual

knowledge as the “individual ability to draw distinctions within a collective domain of action, based on an appreciation of context or theory, or both” (p. 979), and organizational knowledge as “the capability members of an organization have developed to draw distinctions in the process of carrying out their work, in particular concrete contexts, by enacting sets of generalizations (propositional statements) whose application depends on historically evolved collective understandings and experiences” (p. 983). In their beliefs, knowledge starts with action. In order to know how to act, an individual must be able to exercise judgment or draw distinctions based on an appreciation of contexts acquired through past socializations within a form of life, a practice, a horizon of meaning or a consensual domain in which particular criteria of evaluation hold (Tsoukas & Vladimirou, 2001, p. 977; Tsoukas, 2000, p. 105). It requires the individual to engage in discursive practice which allows one to be socialized to obtain not only a stock of experience informing what works and what doesn’t but also the practical skills through on-the-job training to undertake the tasks within the practice.

Personal knowledge becomes organizational when members of an organization draw distinctions in the course of their work, by taking into account not only the situatedness of their actions but also the generalization provided to them by the organization in the form of generic rules, and “the proper application of a rule is not an individual accomplishment but is fundamentally predicated on collectively shared meanings” (Tsoukas, 2000, pp. 108-9). An organization acts like a community of practice in which members share their stories and artifacts that constitute a type of knowledge called heuristic knowledge “that has been historically generated in response to remarkable [past] events” (Tsoukas, 2000, p. 107). This shared sense of interpretation informs members what a rule means and under what circumstances should they be applied. This is what Tsoukas called “dispositions or

improvisation” that is acquired from past socializations in contexts outside the firm and largely determines how they see the world and behave in face of a particular situation in time-space. In a particular interactive situation, an individual will select out, on the one hand, what he or she understands to be the relevant aspects of both his or her role-related normative expectations in the organization and his or her set of dispositions, and, on the other hand, those relevant aspects of the local conditions within which his or her actions take place; and tries to fit the two together (Tsoukas, 1996, p. 19). Because of this, Tsoukas and Vladimirou (2001) reminded that “abstract generalizations are in themselves incomplete to capture the totality of organizational knowledge. In action, an improvisational element always follows it like shadow follows an object” (p. 988). In short, it can be said that heuristic knowledge that resides both in individuals’ mind and in the community of practice serves to link personal and organizational knowledge.

In sum, the dynamic interaction between individual and organizational knowledge remains largely unresolved (Nonaka & Peltokorpi, 2006, p. 77; Spender, 1996a, p. 51). The positivists’ view that an organization is able to learn either through its members or by assuming that it has the same learning capacity as humans is not convincing in providing explanation for the transition of learning from an individual to the organization. The various communicative approaches taken by the interpretivists also require further empirical testing. But it is worth noting that language use, social practices and the personal sense-making judgment to apply role-expected norms to local situations are possible keys to bridge the micro and macro level of behavior.

2.4 Knowledge Management in Healthcare

It has been argued in Chapter One that KM is directly relevant to the practice of EBM. However, research on knowledge creation and utilization model in the healthcare field is still wanting. In the early days, there was a clear stance of the influence of positivist ideology on KM in healthcare field. Knowledge was equated with information and an IS / IT approach was advocated to the management of data and information in response to the call for managing information explosion facing clinicians, which gave rise to clinical informatics (Heathfield & Louw, 1999; Jackson, 2000). Wyatt (2001) provided many different ways of how explicit and tacit knowledge based on Nonaka's classification can be managed using Hansen (1999)'s codification and personalization strategies such as the implementation of practice guidelines, the development of decision support systems (DSS), and the establishment of clinical governance. Nicolini, Powell, Conville and Martinez-Solano (2008, p. 250) quoted numerous examples to highlight the central role of electronic libraries and repositories of scientific information in the form of articles, guidelines and clinical protocols in the support of EBM. IT-based KM tools become the focus of the literature. Pedersen and Larsen (2001) presented a distributed health knowledge management model that structures DSS based on product state models and proved that the model enhanced the operational efficiency in healthcare administration. Chae, Kim, Tark, Park and Ho (2003) presented an analysis of healthcare quality indicators using data mining and DSS for developing quality improvement strategies. Abidi, Cheah and Curran (2005) advocated the use of data-mining techniques for the operational management of healthcare enterprises. Similarly, Wickramasinghe (2006; 2008) introduced the enabling role of data mining for realizing the knowledge spiral in a meta-framework. In addition, he also illustrated how e-mails can be used to support knowledge creation (Wickramasinghe & Lichtenstein, 2006). In fact, Sharma, Wickramasinghe and Gupta (2005) reiterated the need for the incorporation of people,

processes and technologies to improve the efficiency in healthcare delivery. The application of intelligence continuum model is one such example (Wickramasinghe, 2007). Besides e-mails, other web-based tools such as the Application Service Provider model were also examined to discover in what ways they can assist healthcare practitioner in information management (Cruz, Rodriguex, & Sanchez, 2007).

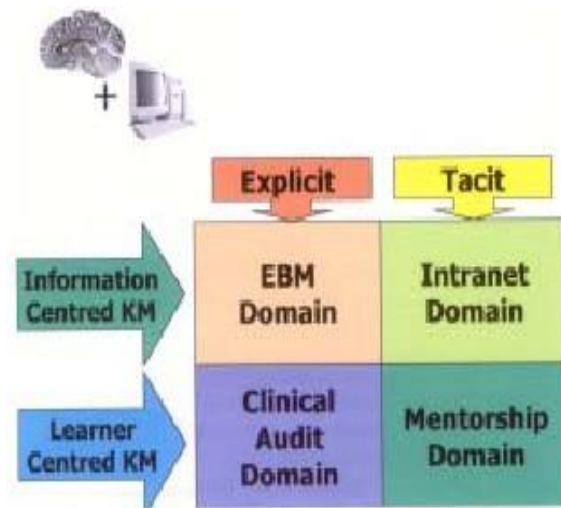


Figure 2.13 Model of Knowledge Management in Primary Care (De Lusignan, Pritchard, & Chan, 2002, p. 301)

There are not many KM models for healthcare. De Lusignan, Pritchard and Chan (2002) put forward the first KM model for primary care practitioners to support the practice of EBM. Building on Nonaka and Takeuchi (1995)'s SECI model, the model in Figure 2.13 above seeks to balance the need for both explicit as well as tacit knowledge using both the “information-centered” and “learner-centered” styles. Four prototypical activities on learning types are proposed: practice of evidence-based care, the use of Intranets, clinical audit learning activities and the person-to-person mentorship program. It provides a framework of how the set of knowledge activities for primary care practitioners might be made up and what the place of information technologies might be within the model. Dwivedi, Bali and Naguib

(2003) introduced Organization Current Knowledge Design (OCKD) as another KM framework which was claimed as more holistic to support the designing, building, and maintenance of a knowledge-sharing platform both from an IT and organizational perspective. However, these models are far from useful in unlocking the mystery of knowledge creation, sharing and utilization in the healthcare field.

Realizing the marginal impact of IT-based KM tools on the outcomes of healthcare, the interpretivistic approach began to proliferate in the literature. Liebowitz (2007) and Zhu (2007) took the view that healthcare knowledge was socially constructed and argued that social network analysis and knowledge audits could be combined to address the problem of knowledge dissemination across different functional silos in healthcare organizations. This was echoed in the concept of “mindlines” that Gabbay and le May (2004) developed as socially constituted tacit knowledge on which clinicians rely to inform their day-to-day practice. These mindlines were constructed not only from brief reading but also the clinicians’ own and their colleagues’ experience, their interactions with each other and with opinion leaders, patients and pharmaceutical representatives, and other sources of largely tacit knowledge. Ryu, Ho, and Han (2003) used the theory of reasoned action and planned behavior to investigate factors affecting physicians’ knowledge sharing behavior in hospitals. Lee and Foo (2007) further advocated narratives and discussed the role of three different types of narratives in healthcare organizations.

More and more discussion was found in the literature on the important role of informal networks and COPs in conveying evidence to healthcare personnel. Gabbay et al. (2003) revealed in their studies that KM and collective sense-making processes did occur in two multi-agency COPs and suggested ways in which evidence-based policy development in the

health and social services might be strengthened. The experience of NHS in UK further proved that COPs are effective means to spread the best practice to improve health (Sandars & Heller, 2006). In the review of Barwick, Peters, and Boydell (2009), COPs were shown to transcend the barriers and limitations inherent in traditional continuing medical education; have positive effects on the acquisition and maintenance of knowledge in cardiovascular care; reduce time to treatment, improve waiting times, and increase patient and staff satisfaction in emergency care; and improve operating-room practices and effective techniques among leading heart surgeons resulting in a twenty-four percent drop in overall mortality rate for coronary bypass surgery. Successful COP attempts to bridge the research-practice gap in EBM include the Caledonian Development Model (Tolson, Booth, & Lowndes, 2008), CHAIN (Russell, Greenhalgh, Boynton, & Rigby, 2004), the COPs in Ontario's children's mental health sector (Barwick, Peters, & Boydell, 2009). However, there were also studies that point to the contrary. For instance, Addicott, McGivern and Ferlie (2006) found that while networks were supposed to have a greater capacity for the transfer of evidence-based practices across the network and accelerated organizational learning, the KM role in NHS cancer networks remained marginal as they were hampered by the political constraints imposed on these networks. Li et al. (2009) also warned that amongst all the 13 papers related to the COPs in the healthcare sector, none of them met the eligibility criteria for the quantitative analysis and thus the effectiveness of COPs in this sector remained unclear.

The only model that is based entirely on a social construction view of knowledge is the Knowledge Domain Process (KDP) model developed by Evans and Alleyne (2009). Taking a process modeling approach, the model aims to present a multi-dimensional abstraction of the environment and processes involved in knowledge creation and dissemination. As illustrated in Fig. 2.14 below, the model consists of six layered but distinct components:

events, knowledge artifacts, individual knowledge process, group influence, organizational context and temporal cycles of time. An event will trigger the attention of an individual, who by taking reference to knowledge artifacts present in the organization such as best practices, policies and procedures, will create knowledge through the three stages of filtering, applying human judgment and constructing new knowledge. This largely captures the essence of Tsoukas' (1996; 2000) conception of knowledge creation. Knowledge is created not just at individual level but also at group level simultaneously. The group influence is represented by individuals that overlap along the Z-axis in the model as a group or community to reflect the social construction of knowledge. Here, the knowledge concept is taken from Vygotsky (1962) and his activity theory colleagues. It emphasizes that group members simultaneously influence and are influenced by individual cognitive processes by factors such as shared values, norms, practices, and group culture. Organizational context is to help individuals and group members understand the organization's KM initiatives and practices. The concept of time is to indicate the past and future knowledge states. Although the model is not meant to create a complete epistemological or ontological view of all knowledge processes, it synthesized the works of many interpretivists and is by far the most comprehensive KM model identified in the literature that finds its application in an inter-professional care setting within healthcare to illustrate how knowledge is constructed, shared and used across numerous healthcare communities. Unfortunately, it is a work-in-progress and is still under development. Otherwise, it will be very useful to this research. This also points to the necessity of further research into knowledge creation activity in the healthcare field.

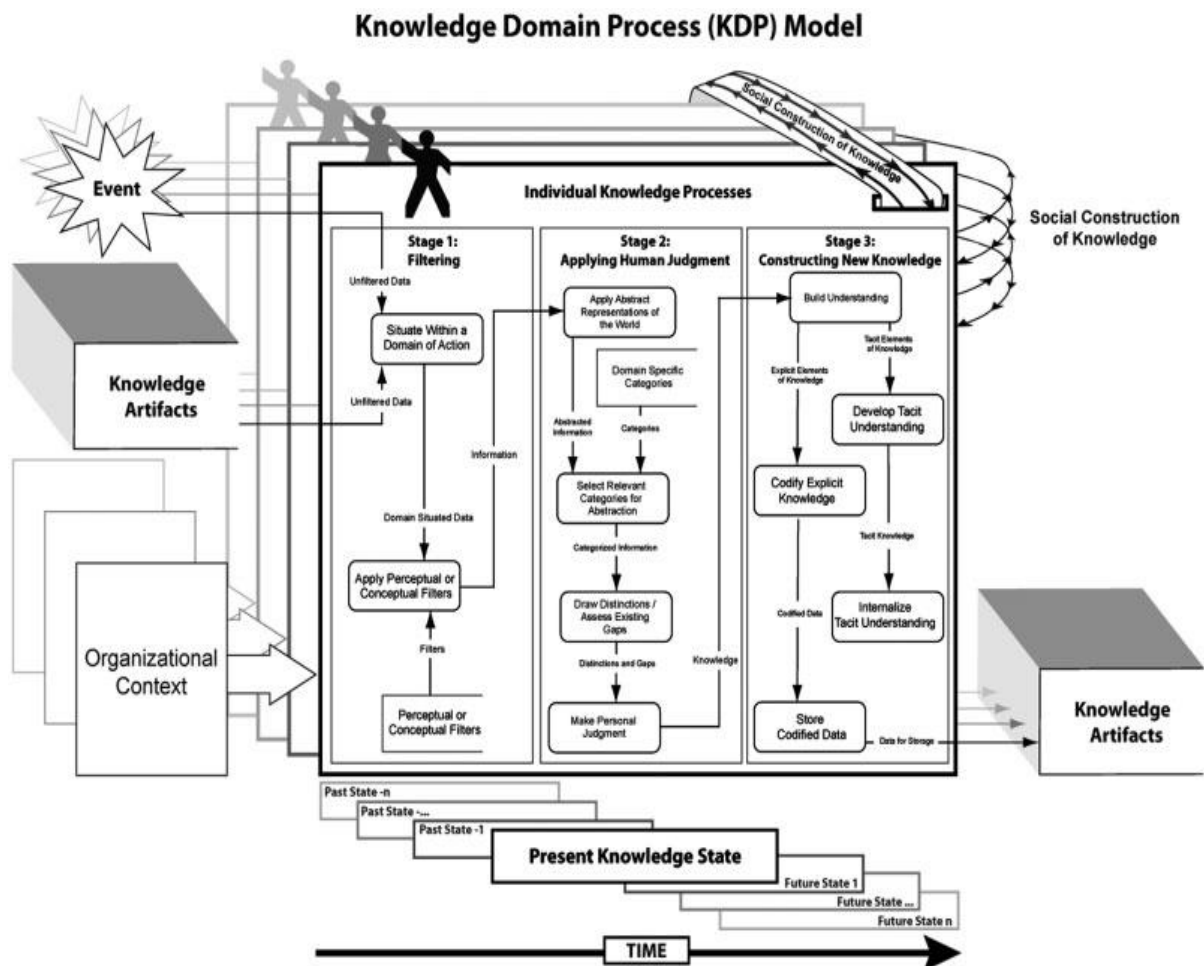


Figure 2.14 Knowledge Domain Process (KDP) Model (Evans & Alleyne, 2009, p. 150)

2.5 Conclusion – Research Gaps

This voluminous literature review of the nature of knowledge from the Greek age to the contemporary times including the current approaches to KM illustrates very clearly that knowledge is an extremely fuzzy and ambiguous concept containing so many socially constructed elements that sense-making theories stand out as the most sensible and appropriate research lens for KM amongst myriads of interpretive and critical inquiry philosophies. A working definition of knowledge comprising six components and KM are thus derived from the centerpiece of sense-making theories. Knowledge is thought to be situated within a particular domain and KM is to create an environment conducive to

knowledge creation, sharing and utilization at both individual and organizational levels. Understanding knowledge construction is thus fundamental to the overall concept of the KM process, in regard to theory and practice. In addition to being of crucial importance, knowledge construction was also found to be the most difficult aspect of KM, from either a theoretical or a practical viewpoint. The review of various knowledge creation models indicated that the research and practice gap still exists and no known model has been developed so far to provide a comprehensive view of the elements and processes involved in knowledge creation. What is commonly found is the incorporation of both epistemological and ontological dimensions, but how knowledge is actually created in individual heads in these processes is not pinned down with firm theoretical and empirical support. In addition to the mystery of knowledge creation by individuals, it is also an unknown of how knowledge of an individual is linked to that of the organization. The discovery by the research of Maturana, Varela, von Krogh, Roos, Spender and Tsoukas that language use, social practices and the personal sense-making judgment may provide possible links between individual and organizational knowledge still awaits further empirical testing. With these unknowns, there is a lack of knowledge creation models and research in the healthcare field; only KDP model is more promising. This research is to fill these missing gaps in the literature.

Sense-making theories have been identified as the research lens for this research. We can also discern many traces of sense-making theories in the review of knowledge creation model and the link between individual and organizational knowledge such as the time-space concept, the triggering effect of a puzzling event or situation, the way the puzzling situation is handled, and the influence of the environmental change. The next chapter will review the leading sense-making theories before explaining the research methodology in full details in Chapter Four.

CHAPTER THREE

LITERATURE REVIEW – SENSE-MAKING THEORIES AS THE THEORETICAL FRAMEWORK

Knowledge made today is rarely perfectly suited to application tomorrow, and in some cases becomes tomorrow's gap.

Brenda Dervin

How can I know what I think until I see what I say.

Karl Weick

We always know more than we can say, we will always say more than we can write down.

David Snowden

3.1 Introduction

The literature review in Chapter Two illustrates a clear trend towards a communicative approach to study KM, and sense-making theory stands out as the most appropriate research lens for this thesis. Extending from the literary meaning of making use of five senses to perceive and understand the world, sense-making has been gradually evolving into broader theories focusing on user-oriented research. Recently, five schools of theories that receive increasing attention in different fields of studies have emerged (Dervin & Naumer, 2009; 2010). Three out of these have more applications in KM research than others and thus are selected to form the focus of this review. They are the audience and user studies of Brenda Dervin's Sense-Making Methodology (SMM); organizational studies or organizational communication of Karl Weick's sensemaking; and knowledge management of David Snowden's sense-making. Besides bearing the same label though in different grammatical forms, these three leading sense-making theories share many commonalities as well as differences. Dervin's SMM is widely recognized for research in understanding individual

sense-making and communication. Weick's and Snowden's theories are known for research in organizational sense-making. To what extent these theories complement each other to serve as the research lens for this thesis requires a critical review and comparison. There are some reviews of these theories in the literature (Dervin & Naumer, 2009; 2010; Browning & Boudès, 2005), but in-depth comparison of these three leading authorities in sense-making is still lacking. This Chapter aims to compare and contrast their parallels and differences with reference to knowledge creation, sharing and utilization in order to derive a complete theoretical framework from a micro to a macro level to guide this research. In order to differentiate clearly what is being discussed, I will use the term "sense-making" to refer to the general discussion of the concept and use the specific term adopted by individual author to refer to their specific approaches.

3.2 Philosophical Origins of Sense-making Theories

All sense-making theories in this review share the same philosophical roots in phenomenology of the 20th century and constructionism. However, the discourse communities are quite different though related to some extent. Dervin's SSM has been developed since 1972 with the concerted efforts of herself and her colleagues, and was first articulated as Sense-Making in 1983 (Dervin, 2005b, p. 26). Dervin's background is in communication. Until 2012, she has been the Professor of Communication, and Joan N. Huber Faculty Fellow in Social and Behavioral Sciences in the School of Communication at Ohio State University where she previously served as the Department chairperson. She received a bachelor degree in home economics with an emphasis in journalism from Cornell University in 1960. She developed interests in communication when she worked as a public relations assistant for the American Home Economics Association from 1961 to 1962 and as a communication specialist at the University of Wisconsin focusing on communicating with

the urban poor from 1963 to 1965 (Barbato, 1996). Her growing interests in communication took her to study and earn her MA and PhD in Communication Research at Michigan State University in 1968 and 1971 respectively. Since 1972, her growing concern for the urban poor has led her to expand her study to information poverty that impacts all citizens. She found that the traditional mode of communication that categorizes users in terms of demographics, psychological traits and geography will only exacerbate the existing disparities in communication between haves and have-nots. She saw a pressing need to explore an alternative way to bridge the information / knowledge gap (Dervin, 2003m, p.48; Barbato, 1996, p. 107). SMM was developed to this end as a methodological approach to studying information needs, seeking and use communicatively, and has been gradually “evolved into a generalized communication-based methodology useful for the study of human sense-making (and sense-unmaking)” (Dervin, 1979, p. 729) that embraces “a set of assumptions, a theoretic perspective, a methodological approach, a set of research methods, and a set of communication practices” (Dervin, 2003c, p. 331), all oriented to systematically giving voice to the unvoiced, or hearing users / audience on their own terms.

Dervin openly acknowledged that her SMM drew primarily on the intersections of the writings of American and European theorists in the fields of philosophy, sociology, psychology, education, cultural studies, communication, and feminist, cultural, and postmodern studies espousing theories often seen as competing: chaos, complexity, deconstruction, cultural studies, pragmatism, phenomenology, critical, administrative (Dervin, 2005b, p. 26-27; Dervin, 2008a, p.3). Amongst these, the influence of phenomenology is the most obvious. Dervin (1999a) admitted that she particularly owed debt to the following philosophers whose teachings informed her thoughts on the development of her Sense-Making theory: Richard F. Carter, Jerome Bruner, Paulo Freire, William McGuire, Raymond

A. Morrow, Graham Murdock, Pierre Bourdieu, Michel Foucault, Hans-Georg Gadamer and Jurgen Habermas, the latter four of whom had ties with Hegel's *Phenomenology of Spirit* (Gross, 2010, p. 18). Wilson (2003) also echoed by arguing that Blumer's social interactionism which is one of the sources of Dervin's ideas on Sense-Making had links to and is much in common with phenomenology. He stated that George Herbert Mead, Blumer's teacher, studied in Freiberg, and must have come into contact with the ideas that led Husserl to develop phenomenology as a philosophical discipline in the same institution. Dervin's (1999a) statement that the term sense-making was emerged in the early years of the phenomenological tradition provides further proof that Dervin's SMM has historical roots in the phenomenology of the 20th century.

Another philosophical root of SMM is social constructivism. Social constructivism espouses the view that individuals construct their worlds through their own actions and perceptions. To Dervin, sense-making means "how people make sense of their worlds" (Dervin, 2003b, p. 223). She considers that the world is "sense-made" with individuals experiencing, interpreting, identifying choices, and otherwise enacting their sense-making processes throughout the course of their lives (Dervin, 2003k). In fact, her definition of sense-making as "behavior, both internal (i.e. cognitive) and external (i.e. procedural) which allows the individual to construct and design his / her movement through time-space" and in particular, how he or she constructs information needs and uses in the process of sense-making denotes explicitly that the theory's philosophical foundation rests on constructivist assumptions with a critical stance towards objectivism and positivism (Dervin, 1983; Dervin & Frenette, 2003, p. 239; Savolainen, 1993, p. 16). Dervin (1983) also described that SMM was evolved from a constructivist approach at the beginning into a post-constructivist, or postmodern modernist approach in a later stage and finally into a communitarian approach in 1994 (Dervin, 2003i)

and a verbing approach in 1997 (still current) (Dervin, 2010b). SMM also borrows from the critical theory of Gramsci, Foucault and Freire, and presents a method for understanding power relations in a dialogic “surround” (Anonymous, 2010).

Karl Weick’s sensemaking theory shares the same constructivist root as Dervin’s SMM. He earned his bachelor's degree at Wittenberg College in Springfield, Ohio and his PhD in organizational psychology from Ohio State University in 1962, nearly the same year that Dervin developed interests in communication. From Ohio State, his work turned increasingly towards social psychology and he received several academic appointments at different universities until he finally settled down at the Ross School of Business at the University of Michigan in 1988 as the Professor of Organizational Behavior and Psychology (Miner, 2006, p. 91). He began to focus on sensemaking in the early 1970s. Although his sensemaking is an organizational theory and reflects most his social psychology background in themes like threat-rigidity, commitment-de-commitment, doubt-self-fulfilling prophecies, and dissonance-assurance, it does have many traces of organizational studies and communication theory similar to Dervin’s (Browning & Boudès, 2005, p. 32; Dervin & Naumer, 2009). Dervin (1999a) refuted some of the links and stated, “There are many uses of the term sense-making as phenomena in the literature (spelled myriad different ways) which have no relationship to Sense-Making Methodology. For example Weick’s (1995) *Sensemaking in organizations* proposed looking at organizational life by examining the phenomenon – sensemaking” (p. 729). She only acknowledged that both have many parallel approaches (Dervin et al., 2005). The theory’s roots of constructivism and interpretivism are revealed clearly in the rich and diverse influence of a multitude of thinkers spreading from psychologists (e.g. James), pragmatists (e.g. Dewey, Mead), organizational researchers (e.g. Selznick, Festinger), systems theorists (e.g. Boulding), phenomenologists (e.g. Schutz) to

social scientists (e.g. Berger, Luckmann, Blumer, Garfinkel) on the conceptualization of sensemaking as “a central activity in the construction of both the organization and the environments it confronts” (Weick, 1995, p. 69). In Weick’s (1995, p. 4) view, sensemaking simply means making of sense or structure the unknown. The central question is how people construct what they construct, why and with what effects. Thus, he argued that sensemaking is “about such things as placement of items into frameworks, comprehending, redressing surprise, construct meaning, interacting in pursuit of mutual understanding, and patterning” (Weick, 1995, p. 6). By placing emphasis on actions, Weick argues that sensemaking is a shared and communal activity that produces knowledge appropriate for action; it is a process that is highly collaborative and dependent on interpretation. In his view, there is no such thing as organization, there is only organizing and the emphasis is on “process of becoming” rather than the “states of being”. Organizing and organization come alive in the ways they construct themselves and in the ways those of us who study them construct them (Gioia, 2006, p. 1711). This strikingly reveals evidence of constructivism in Weick’s theory.

Coming from the management science background, the origins of David Snowden’s theory is significantly different from those of Weick and Dervin who are academics, except for the influence of phenomenology. Snowden developed his ideas on sense-making while working in IBM as the Director of the Institution for Knowledge Management. Subsequently, he founded the Cynefin Center for Organizational Complexity and is now the Founder and Chief Scientific Officer of Cognitive Edge, which is a network that focuses “on rejuvenating management practices to better equip organizations when addressing intractable problems or seizing new opportunities in uncertain, unpredictable and complex situations, especially where traditional approaches have failed” (“Cognitive Edge Network”, 2014). His interest is in applying humanistic approach to KM to help organizations improve decision-making. He

calls his approach as “naturalizing sense-making”, which seeks to apply social science research and practice in the natural science on a foundation of cognitive science, semiotics and epistemological pragmatics to sense-making in organizations (“Dave Snowden,” 2008). Thus, he makes frequent references to literary and science fictions (Browning & Boudès, 2005, p. 32). Besides being a practitioner, Snowden also holds a variety of concurrent academic positions in many countries. His research reflects both his practitioner and academic perspectives. Snowden also attempts to bring complex adaptive systems (CAS) theory and narrative into his sense-making theory. His Cynefin framework “has been acknowledged as one of the first practical applications of complexity theory to management science” (Chowdary, 2008) and has outgrown its application in KM to other areas of consultancy, strategy development, management training, policy-making, product development, market creation, branding and leadership (Kurtz & Snowden, 2003, p. 467).

The present research focuses on investigating how an individual creates knowledge and how an individual knowledge is linked to that of the organization. It takes an interpretivist stance to define knowledge as a socially created process of sense-making. Thus, the research lens should also have interpretive perspective to enable deep understanding of users in terms of their processes of creating and sharing knowledge. With deep roots in phenomenology, social constructivism, and communication, Dervin’s SMM is deemed more appropriate for this research than the other two sense-making theories. The applicability of SSM to design KM practices was introduced by Dervin in 1998 and she called for alternative KM practices. She suggested that KM practitioners are struggling with issues which she and colleagues have been zeroing in on since 1972 (Cheuk & Dervin, 2010b, p. 202). Cheuk (2007a; 2007b; 2008a; 2008b; Cheuk & Dervin, 2010a; 2010b) and Souto (2007; 2008; 2010) have been applying SMM into their KM research. It also has wide applicability in health

communication (Song, 2007; Teekman, 2000) with papers winning three top papers awards in 1980 and 1981 from the International Communication Association (Dervin, 1995). In fact, the approach is widely adopted in the field of library and information science.

3.3 Situations for Knowledge Creation

Dervin's Sense-Making theory is built on a number of metatheoretical assumptions about the nature of human beings that are necessarily related to assumptions about the nature of reality (ontology) and the nature of knowing (epistemology) (Dervin, 2003k, p. 139). What then is the nature of reality? To Dervin (1983), one of the fundamental aspects of the reality is that it is neither complete nor constant but rather filled with fundamental and pervasive discontinuities or gaps. She was agonized by the polarized approaches that divided the research genres in all fields of social sciences and applied sciences – order versus chaos, diversity versus solipsism, authority versus tyranny, cognitive versus emotional, information versus entertainment, mind versus body, conscious versus unconscious, global versus local, structure versus agency, individual versus community, nature versus nurture, qualitative versus quantitative, administrative versus critical, and theory-driven versus applied (Dervin, 2010a; 2003f). Such polarizations had impeded research, practice and design of information systems to such a great extent that she finds it necessary to adopt pluralism and the “in-between” approach so as to study communication communicatively. Her SMM is to thrust “itself between chaos and order, structure and person, facts and illusions, external worlds and inner, universals and particulars” (Dervin, 1999a, p. 730). It goes without saying that both the reality and humans are considered as sometimes orderly, sometimes chaotic, sometimes decentered, sometimes centered, and sometimes fluid, sometimes rigid (Foreman-Wernet, 2003, p. 7; Dervin, 2003k, p. 141). Under the influence of Carter's discontinuity model, Dervin stresses that discontinuities or gappiness are found in all existence, for example,

“between entities, between times, and between spaces, between reality and human sensors, between human sensors and the mind, between mind and tongue, between tongue and message created, between message created and channel, between human at time one and human at time two, between human one at time one and human two at time one, between human and culture, between human and institution, between institution and institution, between nation and nation, so on” (Dervin, 2003f, pp. 270-271). These gaps can be cognitive, emotional, physical and spiritual. They are also changeable across time-space because of differences across time (for example, self today vs. self yesterday and different persons at different times view the gap differently), differences across space (for example, the experience of a particular condition in differing cultures, contexts, communities and material circumstances will affect how the gap is interpreted), and differences in how humans see the reality arising from their differing anchorings in time-space. This implies that the reality is also subject to multiple interpretations in Dervin’s view and different persons will construct different pictures of the reality in different time-space.

How can an individual overcome these gaps in life? Dervin illustrated this process with the metaphor of journey shown in Figure 3.1 below. The metaphor depicts a running squiggly human, a body-mind-heart-spirit living in a time-space, who moves through time-space by using whatever sense he or she has already constructed based on past experiences. When a situation is encountered that blocks his or her movement, implying the running out of old sense or the available sense, he or she has no choice but to make new sense of the gaps and build interpretive bridges over these gaps in order to keep moving. “Sense is not seen as being ‘out there’ but rather as being something that the individual constructs” (Dervin, 2003d, p. 43). Sense-making refers to this particular point of need that requires constructing a new sense and building a new bridge across the gap. Sense-making is in fact gap-facing and gap-

bridging and in different time-space, humans need to construct different interpretive bridges over a gappy reality (Dervin, 1999a, p. 730).

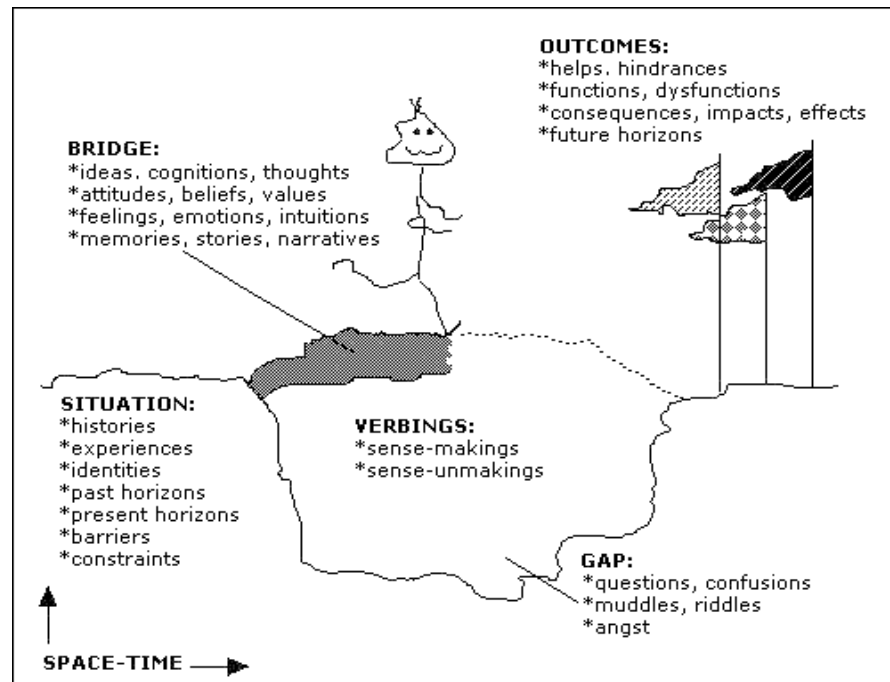


Figure 3.1 Gap-bridging in the making (Savolainen, 2006, p. 1122)

In this metaphor, the sense-maker has to “move” from a “situation” to cross a “gap” using a “bridge” that leads in time-space to “outcomes” (Dervin, Reinhard, Song & Reed, 2006). In Dervin’s conception, situations consist of the time-space contexts in which sense is constructed. Gaps are where the individual sees something missing in his or her sense. This very moment of being stopped in a problematic situation also originates the most important questions (Savolainen, 1993, p. 17). New sense is created when the individual sees a gap as bridged. Uses or helps are the ways in which the individual puts the newly created sense to work in guiding his or her behavior (Dervin, 2003a, p. 256; 1983). What is key to this central metaphor is the facing of gaps and building of bridges. It is conceptualized as step-takings that human beings undertake to construct sense of their worlds as a mandate of the human condition. Dervin (2003f) further pointed out that “These step-takings, or communicatings,

involve both internal behaviours (comparings, categorizings, likings, dislikings, polarizings, stereotypings, etc.) and external behaviors (shoutings, ignorings, agreeings, disagreeings, attendings, listenings, etc.)” (p. 273). What kind of study is concerned with internal and external behaviors? Again, Dervin (2003f, p. 271) refers it to information or knowledge management, design, and practice. For her, sense-making has been about knowledge management from its inception (Dervin, 1998, p. 37). She emphasized that we must “look to the gap: this is where you will find the action in sense making and sense-unmaking making; in communicating; and, *in the creating, seeking, using and rejecting of information and knowledge*” (Dervin, 1998, p. 39) (Emphasis added). It means that sense-making is about gap-bridging, and knowledge is created, shared or used when gaps are bridged.

Furthermore, gap-bridging is characterized as situational and will be predicted by situational conditions (Dervin, 2003a, p. 256). Building on the assumption that the reality is both orderly and chaotic and the conceptualization of humans as both centered and decentered (Dervin, 2003c, p.332), gaps are changeable across time-space and are perceived differently by different or the same individual in different or the same time-space. Gap-bridging is therefore tentative and experimental in nature. Each step-taking to bridge gaps is a new step that occurs in a new moment in time-space and cannot be fully instructed or determined a priori. “Even if the next step (the next moment) is in conformity, it is a step made anew by the individual” (Foreman-Wernet, 2003, p. 8). It is highly likely that “today’s knowledge often becomes tomorrow’s struggle” (Dervin, 1998, p. 40). The whole idea is to anchor gap-bridging in its own time and space with particular situational conditions. This is what Dervin and Frenette (2003, p. 239) characterize it “situated communicative practices”. How the gap is bridged or how knowledge is created depends on how the situation is defined, how the gap is conceptualized, what kind of bridge can be built and how he or she can proceed with the

journey after crossing the gap over the bridge. Any given movement can be interpreted as an individual is confronted by the need for some form of guidance; that is, when they need to know something. The gaps can be bridged by thinking up of an answer, asking for help, looking for useful information, or by any other measure that enables the individual to continue moving. This situational characteristics of gap-bridging that renders it as “responsive to and mandated by changing situational conditions” (Dervin, 2003a, p. 255) “provide the basis for developing a coherent approach to situationality” (Dervin, 2003d, p. 43). This characteristic also enables us to study knowledge creation systematically by using a situational approach.

There is no other sense-making theory that states as explicitly as SMM about the situation under which knowledge creation occurs and how they can be studied. As this research is to study the process of knowledge creation, sharing and utilization in healthcare organizations and the way it will contribute to the bridging of the implementation gap of EBM, the concept of gap-bridging in SMM is found highly relevant.

The situationally-bound approach provides the fodder for a new kind of prediction – the prediction of information seeking and use. Since SSM assumes that sense-making behavior is situationally and contextually bound, and is rooted in past (histories, memories, and narratives), present (current conditions, material and experiential) and future (hopes, dreams, plans, and trajectories) time-space (Dervin & Frenette, 2003, p. 239), it posits that “sense-making behavior can be predicted more successfully within the framework of a model which focuses on changing situations as predictors rather than such constant across time-space attributes as so-called personal characteristics or demography” (Dervin, 1983). The traditional information seeking and use studies that attempt to characterize users as constant

across time-space with static demographic and personality traits or assume situations to be static to those in different domains or tasks tend to predict behavior based on these traits regardless of time, space or change. Dervin (2005b, p. 28) did not find this straightforward, unchanging and mechanistic process wrong but rather “not enough”. Her position is best illustrated in the following statement:

Sense-Making mandates attention to information seeking and use as both potentially constant and potentially changeable across time-space. Likewise, it mandates attention to the conditions under which one would expect one or the other or both. As a methodological frame, then, Sense-Making proposes to provide an avenue for pursuing traditional studies of information seeking use and simultaneously opening up alternatives. The mandate to study time, space, and movement, for example, allows for the possibility of conceptualizing information seeking and use as habitually patterned and / or situationally / temporally patterned. (Dervin, 2005b, p. 28)

The traditional trait approach can be a subset of human possibilities. In Dervin’s world of diversity where there are both chaos / change and order / stability inherent in human sense-making and unmaking, she found it more important to “mandate empirical attention to conditions which foster flexibility, fluidity, and change as well as those that foster rigidity” (Dervin, 1999a, p. 731). These conditions are the situationally-bound predictors manifested in the human mandate to move through time-space. The movement metaphor in Figure 3.1 suggests that situations, gaps and uses constitute the universals of sense-making variables that allow for successful prediction. Numerous SMM studies in the literature (Dervin, Jacobson & Nilan, 1982; Dervin, 2003d, pp. 40-44; Cheuk, 2000; Dervin, 2006; Dervin & Reinhard, 2007; Song, 2007; Souto, 2012) have proved that a shift from cross-situational predictors to situationally-bound predictors has greatly improved the prediction.

The above ideal is implemented in SMM's interviewing approach and analysis method which focus on individual-in-situation and the specific micro-moment to identify a host of situational factors that impact on sense-making and sense-unmaking instead of studying socio-demographic factors such as personality, experience, educational background, domain knowledge, etc. The more microscopically is the analysis, the closer it is possible to get to the moment that these processes take place in time and space (Souto, 2010, p. 146). In other words, SMM is interested to study the whys and hows of sense-making instead of whats. It assumes that "there is something systematic about individual behavior when the individual is reconceptualized not as an entity but as an entity behaving at a moment in time-space" (Dervin, 2003f, p. 274). This research adopts the same approach to analyze the situations facing the informants into knowledge-creating and non-knowledge creating situations and to study in what ways knowledge is created or in what manner knowledge-creation is hindered. This will be further elaborated in Chapter Four.

The above Sense-Making methodology also brings about another characteristic of gap-bridging applicable to KM – the diversity of situations under which gap-bridging occurs. Dervin (1998) acknowledged that KM is a field "on the precipice of chaos, reaching for a means of emphasizing diversity, complexity and people over centrality, simplicity and technology. Sense-making, as an approach, is described as a methodology disciplining the cacophony of diversity and complexity without homogenizing it" (p. 36). Being a "situated communicative practice", gap-bridging or sense-making incorporates both order and chaos as ontological and epistemological assumptions. There is no one single perspective; a person can be situated in an orderly reality or facing chaos or both. A utopian perspective is cherished as an alternative to attend to both human possibilities of rigidity and flexibility, diversity and complexity. The essence is to *encompass all perspectives* to get a more

comprehensive, albeit always in flux, incomplete, discontinuous and elusive picture of the reality, and *to look beyond hegemony and habitus* to redesign communication and information systems that can be more responsive to human needs” (Dervin, 2003i, p. 93; 2008, p. 6). The means is through the interviewing interface that allows systematic address of the gaps and to codify sense-making moments based on the universals of time-space movement categories. It should be noted here that gap-bridging is not regarded a problem-solving activity though it can be one of its subset, but rather a mandate of the human condition.

Dervin’s SMM shares some ideas in common with Weick’s sensemaking theory. Both refer sense-making to a worldview and a mandate that research attends to internal and external sense-making and sense-unmaking. Both also acknowledge that sense-making is invoked not as a problem-solving approach, but to handle the unknown world particularly when people are faced with complex and ambiguous or chaotic environments.

Though Weick’s sensemaking is an organizational theory, he has no intention to tie his theory to the generation of organizational knowledge as Kolko (2010) remarked. But actually his sensemaking model, which consists of the four processes of ecological change, enactment, selection and retention as shown in Figure 3.2 below, can be applied to explicate the creation of organizational knowledge. The model is built on the central argument that an organization should be defined in terms of organizing and organizing is to resolve equivocality in an enacted environment by means of interlocked behaviors embedded in conditionally related processes (Weick, 1979, p. 91). Assembly rules (set procedures) and communication cycles are used in each of these phases to ascertain the level of equivocality and process the information.

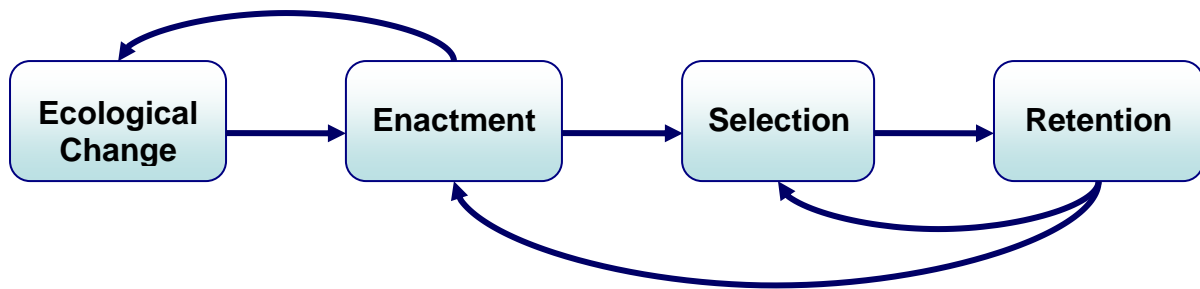


Figure 3.2 Weick's Sensemaking Model

Sensemaking begins when changes in the environment induce disturbance and discontinuity in the flow of information to its organizational members. These discontinuities constitute the raw data or information inputs that have to be made sense of. This leads to the second stage of enactment in which organizational members reconstruct and configure their environment through a two-step decoding process. “First, portions of the field of experience are bracketed and singled out for closer attention on the basis of preconceptions. Second, people act within the context of these bracketed elements, under the guidance of preconceptions, and often shape these elements in the direction of preconceptions” (Weick, 2001, p. 226). By bracketing, labeling and noticing portions of the experience, organizational members highlight information they wish to focus based on their own knowledge or previous successful sensemaking experience. Appropriate assembly rules and communication cycles are identified to assign a new meaning or interpretation to them. It involves doing, acting and performing. The result is an enacted environment which is “an orderly, material, social construction that is subject to multiple interpretations” (Weick, 2001, p. 226). It is still equivocal but the number of possibilities has been greatly reduced so that a plausible story that is able to stabilize the streaming experience begins to emerge. This phase also witnesses the feedback to the environment in terms of new messages or actions to help members make sense of the environment. Thus, enactment is in a reciprocal relationship with the external environment (Weick, Sutcliffe, & Obstfeld, 2005, p. 414).

In the selection process, the number of possible meanings continued to be reduced when additional rules and cycles are adopted to apply previous interpretations to the newly enacted information until they have selected a reasonable interpretation that provide the best fit with past understandings. The outcome is “a set of cause-and-effect explanations that render the environment understandable and meaningful. These explanations have to be plausible, but they need not be the most accurate nor the most complete” (Choo, 2006, p. 7). Finally, in the last retention stage, the most plausible story that proves successful to cope with equivocal situations is retained and remembered as organization memory and narratives. It feeds the future retention and selection processes with a source of guidance to “interpret new changes and to stabilize individual interpretations into a coherent organizational view of events and actions” (Dalkir, 2011, p. 74). This organizational memory can be taken as a form of organizational knowledge as there is a new level of understanding distributed across the organization.

This sensemaking model is basically a matter of information processing. It bears resemblance with Dervin’s SMM in many ways. Environmental scanning can be viewed as the context and power issue that impact an individual’s perception of the situation, gaps, gap-bridging strategies and helps. Enactment refers to action taken in response to the environmental scanning. It is similar to the gap-bridging strategies taken to close the gap encountered by an individual. The helps got after crossing the gap will form the experience of the individual and would be remembered and selected in future when they face similar gapping situations. This is in fact the selection stage in Weick’s model. Finally, retention is the knowledge gained. Dervin’s SMM lays emphasis on the gap and the action needed to close the gap. Dervin also suggested a number of gap-bridging strategies. Weick, however, emphasizes more on the process of gap-bridging. The enactment stage is in fact the reasoning process. It

is very similar to gap-defining. It brackets those information that people in the organization think they could work on and then select from past experience those actions that had been proved successful to handle the problems arisen from that bracketed information (gap-bridging) they are facing now. There is no elaboration on the actions to be taken as it is assumed that the action taken is based on the causal relationships they built in the selection process. Weick's approach is thus a thinking process. It never touches on any specific action or strategy as Devin does. Choo (2006) also concurred that Weick's approach is information interpretation only. Its underlying spirit is drastically different from Dervin's. The difference also explains why his model is not useful to this research.

Another difference is that while Dervin takes a utopian approach to accommodate diversity and complexity of the reality without taking any stand in order to allow diverse voices to be heard, Weick adopts a more restrictive approach. He acknowledges that organizations need to operate diverse informational inputs in a complex environment but conversely sensemaking aims to enable individuals in organizations to remove equivocality from the information environment and to reduce the number of possible outcomes so as to create order and establish a workable level of certainty (Weick, 1969, p. 40). He further described sensemaking as “the reciprocal interaction of information seeking, meaning ascription, and action” (Thomas, Clark, & Gioia, 1993, p. 240) so that organizational members create shared awareness and common understandings out of different individuals' perspectives to give meaning, purpose and direction to the organization. Ambiguity and uncertainty are recognized as the occasions for sensemaking, and the purpose of sensemaking is to impose order and stability on the chaos, not to accommodate it as one of the human possibilities as Dervin does (Weick, Sutcliffe, & Obstfeld, 2005, p. 411). Another major difference with Dervin is that Weick's sensemaking is grounded at organizational level that involves both

individual and social activities. He states that sensemaking occurs when the current state of the world is perceived as different from the expected state or the environment is perceived as uncertain and ambiguous (Weick, Sutcliffe, & Obstfeld, 2005, p. 409; Weick, 1993). This is opposed to Dervin who focuses on human conditions though it can also be applied to both individuals and collectives.

Weick's sensemaking is retrospective in nature. This is not simply to draw on past experience as Dervin said. The key idea is that "people can know what they are doing only after they have done it" (Weick, 1995, p. 24). People act first and examine reflectively their own actions in order to discover what they've done and what the meaning of those actions is in order to rationalize them (Weick, 2001, p. 182). This is illustrated in his famous phrase, "How can I know what I think until I see what I say" (Weick, 1995, p. 12). What concerns Weick is "meaningful lived experience" (Weick, 1995, p. 24). To create meaning or knowledge of these experiences, Weick argues that it is an attentional process and it is only possible to direct attention to what exists or what had already happened. He remarked, "An action can become an object of attention only after it has occurred" (Weick, 1995, p. 26). When people act, they are guided by their own pre-judgments already formed during socialization. The outcome can be in great discrepancies with the expectation. With the benefits of hindsight, organizational members have the opportunity to explore the situation, to discover their preferences, to elicit reasoning that informed the action and thus retrospectively construct the values and beliefs that make sense out of that outcome. With this reasoning, an organization is able to stabilize the environments and make them more predictable, and obtain information so produced for the design of future actions. This explains Weick's view that action guides understanding and "the basic idea of sensemaking is that reality is an ongoing accomplishment that emerges from efforts to create order and make

retrospective sense of what occurs” (Weick, 1993, p. 635). It can be seen that Dervin’s SMM is forward-looking, while Weick’s sensemaking is backward-looking.

The problem underlying this retrospective characteristic of sensemaking is the apparent impossibility for people to make sense about what has not yet been said or done (Marshall, 2011). Or it is unlikely to have prospective sensemaking as Gioia and Mehra (1996, as cited in Gioia, 2006, p. 1718) suggested. Mills (2003) further criticized that “...Sensemaking lacks the ability to explain why and how some ‘inventions’ come to be developed in the first place, or how and why these ‘inventions’ are mediated through a series of ongoing interactions that are guided by rules of behavior” (p. 139). Another handicap is Weick’s narrower view to place too much attention on the imposition of order on various interpretations of situation and the establishment of certainty. There are many other ways for the creation of organizational knowledge, there is no need to synthesize all possible meanings. This is in marked contrast to the approach of Dervin who urges for a system that can open up multiple perspectives and not to be addicted to best practices. This is also echoed by Nonaka and Takeuchi (1995) who regarded “Weick’s view is still passive and lacks a proactive view of organization that includes a notion of “creative chaos” that is critical to the process of organizational knowledge creation” (p.40). This is particularly true in crisis situation in which sensemaking appears to be ineffective. Finally, Miners (2006) casted doubts on the testability of Weick’s theory. He found that only Weick’s paper in 1977 (Bougon, Weick, & Binkhorst, 1977) was a quantitative study; all other studies afterwards are not subject to any quantitative testing. The lack of empirical data is the most critical limitation and it invalidates many Weick’s conclusions. Miners (2006, p. 103) did not find Weick’s (1993) interpretation on the cause of death of the firefighters in the Mann Gulch disaster more compelling than those that might have been derived from other competing theories.

Dervin found that Snowden's ideas bear more resemblance to Weick's ideas. But Snowden thought the otherwise. He said, "I drew on both [Weick and Dervin], but principally Dervin, in some of the key development of Cognitive Edge theory and practice" (Snowden, 2006a). Like Weick, he is interested in organizational sense-making and the importance of dealing with complexity and ambiguity in organizations, but his sense-making framework is used more for improving organizational decision-making as his "naturalizing sense-making" theory is derived from cognitive behavior in making decisions and in complex systems. He defines sense-making as "the way that people choose between multiple possible explanations of sensory and other input as they seek to conform the phenomenological with the real in order to act in such a way as to determine or respond to the world around them" (Snowden, 2006) or simply "How do we make sense of the world so we can act in it" (Snowden, 2008). Reflected in KM, his focus is not on knowledge creation process but on supporting decision-making and innovation. He (Snowden, 2009) said,

The purpose of knowledge management is to provide support for improved decision making and innovation throughout the organization. This is achieved through the effective management of human intuition and experience augmented by the provision of information, processes and technology together with training and mentoring programmes.

Both Snowden and Weick emphasize the ecological environment and its impact on organizational sense-making, but Snowden aims to bring about the ontological diversity and the various approaches to KM rather than establishing order. Like Dervin, he accepts making use of diverse inputs in responding to complexity (Browning & Boudès, 2005, p. 34). In fact, he challenges the assumptions of order, of rational choice and of intent in organizational decision support (Kurtz & Snowden, 2003). This underlying ideology is more in line with Dervin than Weick. He is also the first one to introduce CAS theory into his sense-making

framework known as the Cynefin framework as shown in Figure 3.3 below. It has evolved from Figure 3.4 which was first developed in 1999 with inspiration from Boisot (1995)'s I-Space model in the context of KM to understand the ecology of knowledge. It has undergone a series of evolution before it comes to its current state.

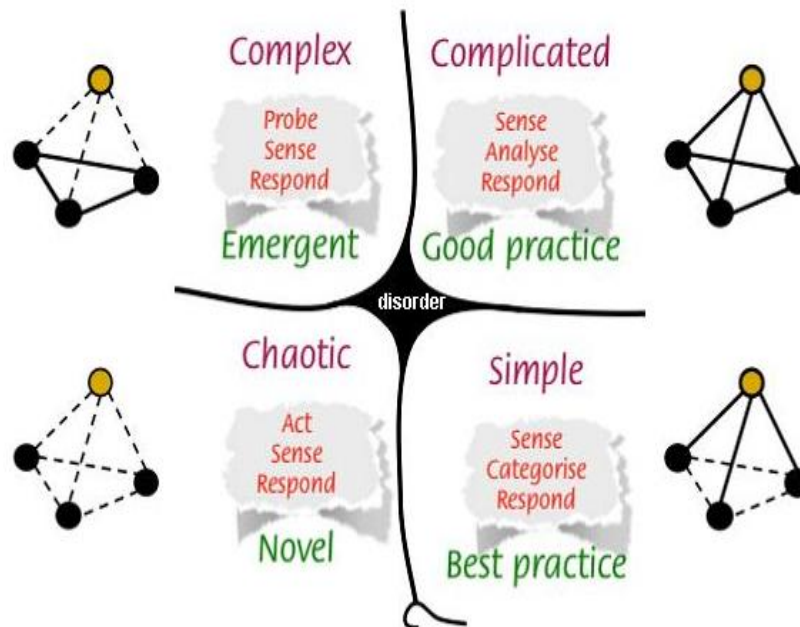


Figure 3.3 The Current Cynefin Framework (Adapted from Snowden, 2010)

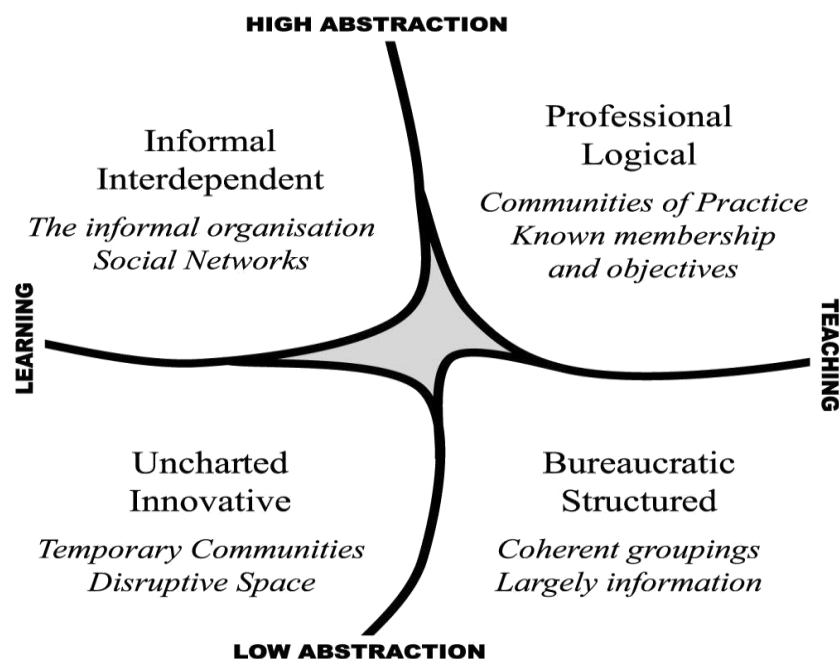


Figure 3.4 The Cynefin Framework Developed in 1999 (Snowden, 2002)

At first, as shown in Figure 3.4, it started with a vertical axis based on the balance between low and restricted level of abstraction and the horizontal axis between teaching and learning cultures (Snowden, 2010). Cynefin is a Welsh word, which is more properly understood as “the place of our multiple affiliations” such as cultural, religious, geographic, tribal, etc., and “all human interactions are strongly influenced and frequently determined by the patterns of our multiple experiences, both through the direct influence of personal experience and through collective experience expressed as stories” (Kurtz & Snowden, 2003, p. 467). It is also different from the concept of *Ba* of Nonaka and Konno (1998) in that it links a community to its shared history rather than just a shared space for emerging relationships (Snowden, 2000, p. 237). At that time, it was not an actual Cynefin model. It is the means to distinguish between formal and informal communities derived from multiple histories of all the players in the knowledge system, and the interaction both with structured processes and uncertain conditions. By 2002, Snowden brought into play the CAS theory and the multi-ontology approach to decision-making to turn it into a real Cynefin framework - a framework not so much for logical arguments or empirical verifications but for collective sense-making and decision-making to give decision makers new constructs to make sense of unspecified problems, to help people consider intractable problems in new ways and to allow the emergence of shared understandings (Kurtz & Snowden, 2003). Sturmberg (2008) combined the past and current Cynefin frameworks into Figure 3.5 in p. 183 to discuss the generation of medical knowledge. This approach proves useful to understand Snowden’s view on KM through the sense-making process.

The framework organizes knowledge into five domains derived from three ontologies, namely ordered, complex and chaotic, with the ordered ontology further divided into known and unknown and is now replaced by simple and complicated respectively. Ontology means

the nature of things and is used to determine the way we know things. Sturmberg and Miles (2013) interpret the right hand side as what is already known and thus can be taught. The left hand side is what is not yet known and thus needs to be learnt. The bottom half is concerned with content, whereas the top half deals with context. Each domain “recognizes the causal differences that exist between system types” (Nilsen, 2013) and “requires a different approach to analysis, interpretation, intervention and management” (Snowden, 2005a, p. 49).

(1) The Simple / Known Domain

This domain belongs to the ordered system where the cause and effect relationship is linear and empirical, and can be applied repeatedly and predictably. Knowledge in this domain is regarded as a thing and explicit that can be captured and embedded in structured processes to ensure consistency (Kurtz and Snowden, 2003, p. 468). This forms the legitimate best practice of the company. The managerial approach is to *sense* the incoming data, *categorize* them on the basis of past experience and *respond* in accordance with best practice. EBM is quoted as an example in medicine that resides in this domain.

(2) The Complicated / Knowable Domain

This domain is another type of ordered system that contains stable cause and effect relationship. But the relationship is not fully known, and needs analysis of the presenting data in light of known facts and application of expert knowledge. Knowledge is gained from methods like scientific experiments, expert opinion, fact-finding and scenario planning and is established as the good practice of the organization. In medicine, structured techniques are developed and codified in the form of guidelines and decision trees. This breeds communities of practice and learning organizations, and thus appropriate for knowledge transfer and communication. The risk is that the application of knowledge relies on trust

between expert advisor and the decision-maker. The high dependency on experts will also easily lead to entrainment in thinking, which may bring catastrophic consequences to the organization. Expertise in this domain “is both an enabler and blocker to knowledge creation and from time to time context must be removed to allow the emergence of new meaning” (Snowden, 2002, p. 107). The best approach managers can take in this domain is to *sense* the incoming data, *analyze* them on the basis of expert advice and *respond* with good practice.

(3) The Complex Domain

Knowledge creation starts in the complex domain. The ontology is un-ordered, which means that “we cannot look at the system without changing it in some ways; we are either managing or creating patterns” (Snowden, 2005a, p. 50). This is also the domain of complexity theory in which cause and effect relationships are so complex that they cannot be clearly defined or predicted but can only be understood in retrospect. Knowledge is gained from sensing the emerging relationship patterns between many different agents. But since these patterns are not predictable, it is futile to rely on past experience or historically entrained patterns to formulate the response. All the techniques in the simple and complicated domains such as good or best practices could no longer apply as complex problems are not subject to categorization or analysis. The best approach is to *probe* the space to make the pattern more visible, then *sense* the patterns and *respond* by stabilizing those desirable patterns and destabilizing those unwanted. Snowden (2006b) suggested creating safe to fail experiments so that people can learn from planned failure. Imposed order would not work. Learning is thus informal and interdependent. Encompassing multiple perspectives by increasing information flow, variety and connectiveness to break down existing pattern and gain new insights become far more important. Sense-making in this domain requires people to act to stimulate evolution of the system and the subsequent monitoring of emergent patterns so that

desired patterns can be supported and undesired patterns disrupted, ultimately allowing the organization to evolve to a future that was unknowable in advance, but is more contextually appropriate when discovered (Kurtz & Snowden, 2007, p. 122). Snowden (2002) advocated utilizing narrative techniques as stories will easily facilitate understanding of context and thus trigger new ideas, concepts and insights.

(4) The Chaotic Domain

This is another un-ordered ontology with no apparent cause and effect relationships. The organization is in such a chaotic situation that requires *speedy action* on the part of the management to stabilize the position first to reduce the turbulence before they have time to investigate change. The next step is to *sense* its result and *respond* accordingly. In the Cynefin Framework, the simple domain lies adjacent to the chaotic because it is very often for the success in the simple domain to breed complacency that leads to catastrophic failure and collapse into chaos. To Snowden (2002), this provides exactly the ultimate learning environment for managers to handle brand new and critical situations. An authoritarian approach can be taken to bring the space back to the simple or complicated domains. Or multiple interventions may be used to create novel practices and shift the situation to the complex domain. Thus, the chaotic domain is most useful and always offers opportunities for innovation to take place and entrainment of thinking to disrupt. A medical emergency situation or the SARS Crisis in Hong Kong in 2003 falls into this category (Lee, 2003).

(5) The Disordered Domain

The central disordered domain denotes the state of uncertainty or not knowing the domain the organization is in as there are “conflicting views reside resulting from different perspectives on the same issue” (Strumberg & Miles, 2013, p. 41). Individuals in this domain will

compete to interpret and assess the situation based on their personal preference for action, and bring the space back to their preferred comfort zones in the framework. This domain is not related to any KM activities.

Instead of placing emphasis on the actual process of creating knowledge, the quadrants in the Cynefin framework focus on formative idea generation and support the creation of mental models that can be used to think of problems and solutions in new ways (Kolko, 2010). This approach bears some resemblance to that of Weick. Both acknowledge that complexity and ambiguity of the environment provides the conditions for knowledge generation. But Snowden's ideas are more than that. The framework actually focuses on diversity and different states of knowledge, which is more in line with Dervin's approach. To Snowden, knowledge is not only a static known fact, but also a flow which can be illustrated through the boundary concept presented in the Cynefin framework. Snowden (2000) argues that the value of the Cynefin framework is "in its ability to assist in descriptive self-awareness within an organization and to understand the flow of knowledge". The boundary between different domains allows the organization to recognize the danger of a single model which will lead to the destruction of requisite variety in ecology, and to appreciate diversity as the key to adaptability (Snowden, 2002, p. 107). Snowden (2005a, p. 51) identified 16 different types of dynamic patterns where knowledge flows from one domain to another and being transformed from one state to another in different times by deploying different techniques. For instance, in times requiring innovation, there is a need to shift the entrained expert knowledge in complicated domain to the chaotic by exposing experts to radically different fields and showing them the invalidity of old patterns so that a new kind of knowledge can be formed by taking them to the complex environment. By making use of Figure 3.6 below, Sturmberg and Miles (2013, pp. 44-59) argued that the strict adherence of EBM to its

hierarchy of knowledge and scientific data made its practitioners blind to other sources of clinical knowledge. EBM as unthinkingly applied may even reside in the simple domain. However, many diseases like cardiovascular diseases have so many complex inter-connected evidences pointing to many different directions that a different approach needs to be pursued. The Cynefin Framework provides the decision tool for clinicians to make sense of the available information in the context of the patient at hand and to determine the appropriate action. It will not provide them with the right answer, but by considering all the available knowledge in the context of achieving the best practice, the Cynefin Framework illustrates to clinicians the inherent failure of EBM to assimilate the humanistic dimension of clinical practice and to realize that a context-driven flexible approach can be enacted. This approach is more important than focusing on what constitutes the right kind of knowledge. In a nutshell, “the framework not only tells us how to approach a set of different situations, but the characteristics also explain enough to help us recognize the situation in which we currently reside” (Anderson, 2013). This emphasis on situations for different kinds of knowledge and the value of chaos shares much in common with Dervin.

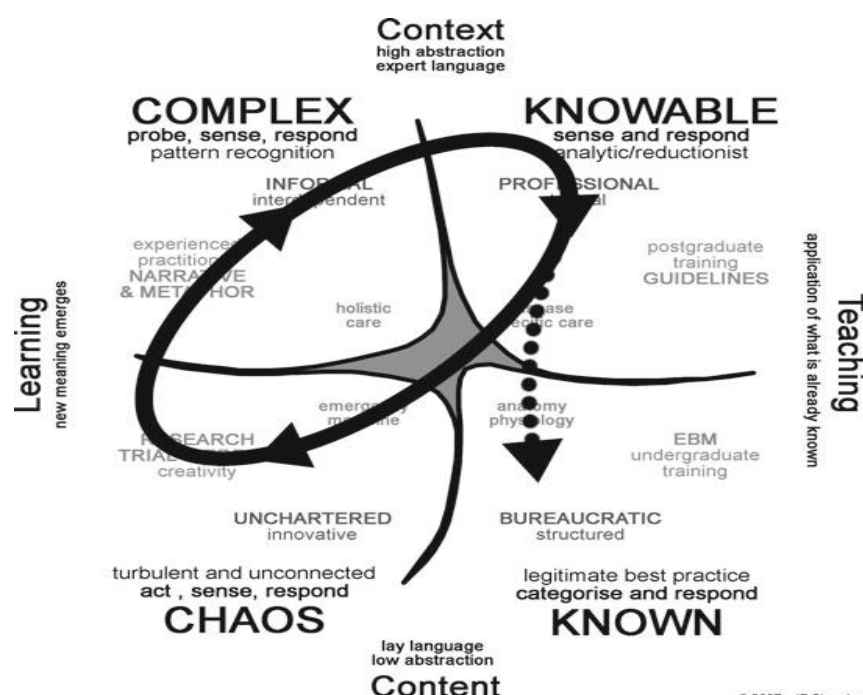


Figure 3.5 Flow of Knowledge in the Cynefin Framework (Sturmberg, 2008, p. 769)

To summarize, Dervin's SMM is found most appropriate for this research. It asks us to focus on the gap which is central in SMM and is where action takes place in the creating of knowledge. Gap-bridging is a kind of situated communicating behavior that will generate direction for the understanding of knowledge creation. It is user-oriented, changing, forward-looking, disciplining the cacophony of diversity and complexity without homogenizing it, and occurring at the intersection of situation, gap and uses in the horizons of past, present and future enabling more accurate prediction of information seeking and use. There are numerous strategies for bridging gaps. This research is to explore these gap-bridging strategies in order to study the process of knowledge creation in healthcare organizations. The next few sections will turn to the nature of knowing and the verbing and process approach that addresses the hows of knowledge creation. Weick's model is quite limited to provide much useful reference. The Cynefine Framework will be useful for the conceptualization of the flow of knowledge in the macro environment and the limitation of EBM practice.

3.4 Nature of Knowledge and Knowing

Dervin alone amongst the three elaborates much on the nature of knowledge and knowing. Snowden shares some of Dervin's concepts. Weick wrote nothing on this. Dervin makes no distinction between knowledge, information and even data because in SMM these concepts "are system distinctions of no meaning to lived experience and movement through time-space" (Savolainen, 2006, p. 1118). Instead, she defines it as "the sense made at a particular point in time-space by someone" and as "product of and fodder for sense making and sense unmaking" (Dervin, 1998, p. 36). In other words, knowledge or information is both the input (fodder) and output (product) of sense-making. Individuals proceed with the knowledge they have in or about a situation until they experience a gap in their knowledge. This bridging of gaps requires information or knowledge outside the individual's previous experience. This

conceptualization of knowledge vividly visualizes how knowledge is used for its further creation, which is fundamental to this research.

In addition, being the sense made, knowledge is not a fixed commodity, but constructed by the individual. Thus, sometimes it is shared and codified; sometimes a number of people agree upon it; sometimes it enters into a formalized discourse and gets published; sometimes it gets tested in other times and spaces and takes on the status of facts; sometimes it is fleeting and unexpressed; sometimes it is hidden and suppressed, sometimes, it gets imprimated and becomes unjust law; sometimes it takes on the status of dogma (Dervin, 1998, p. 36). SMM demands attention not only to the material embodiment of knowing such as cognitions and ideas, but also to the emotional / feeling framings of knowing. In other words, the whole human being in terms of body-mind-heart-spirit with a past history, present reality, and future dreams or ambitions is assumed to move through time-space; it is utterly impossible to separate “the inner and outer worlds of human existence” (Foreman-Wernet, 2003, p. 7).

Knowledge is also conceptualized as a “construction, a product of observer and observation” (Dervin, 2003d, p. 32). Dervin is highly critical of the mechanistic transmission model of knowledge, under which knowledge is conceived as objective and absolute that can be passed on to users who receive them as messages or information as things to be gotten, like dumping something into the heads of receivers as though they were empty buckets” (Foreman-Wernet, 2003, p. 5). Dervin (1999a) does not find this traditional mode useful in modern days as it “freezes time-space and person and restricts information to that produced and used by one narrow set of sense-making strategies” (p. 740). In fact, human species historically have used a wider group of strategies in using knowledge. She argued strongly that the relativistic sciences of the 20th century have shifted the conceptions of knowledge from observer

constructions to user constructions. Knowledge should be studied as a phenomenon of human communicating, which must be subjective and experiential as persons subjectively perceive their worlds and get their views shared. However, given the observational constraints of time, space, change and physiological limitations, no amount of knowledge provided by another can satisfy the needs of an individual in coping with the limited reality of a personal existence. With meanings being in people and with differences in people across time and space, Dervin proposes the view that knowledge use is inherently a creative rather than a passive process as the traditional transmission model suggests. It mandates “making sense when none is given” (Dervin, 2003d, p.33). SMM is introduced as an alternative approach. It assumes that all knowledge is subjective even those agreed upon and called fact; all observing is relevant to both the physical time-space at which the observations were made as well as the psychological time-space of the observer because of the limitations of human observation; knowledge seeking and use is entirely a constructing activity – the personal creating of sense that is tied to the specific time, place, tools and histories of its making; and individuals use their own observations as well as the observations of others to construct their pictures of reality and use these pictures to guide their behavior (Dervin, 2003a, p. 255).

Another characteristic of knowing is that it is “a human tool designed by human beings to make sense of a reality assumed to be both chaotic and orderly” (Dervin, 2003c, p. 328). Given that the reality is both orderly and chaotic, and no human movement in time-space can be fully instructed, each sense-making step must be partly designed by the actor himself, resulting in multiple gap-bridging strategies and multiple outcomes. This human difference means that only the actor himself or herself is an expert as well as the theorist of his or her world. Human beings are conceptualized as information designers rather than information seekers and finders (Dervin, 2003c, p, 329). As a result, SMM requires that knowledge

should be studied from the perspective of the actor, or under a communication perspective, in which knowledge is made and unmade in communication – intrapersonal, interpersonal, social, organizational, national, and global (Dervin, 2003c p. 331). Information systems created should assist people to design their own information and share with others the diverse ways they have struggled to move through the world that is both orderly and chaotic. Only by so doing can a person define his or her own standards to judge something as informative and hence permits humans to tolerate and muddle through diversities and seeming incompletenesses (Dervin, 2003c, p. 331).

This emphasis on looking to the actor and receivers on their own terms mandates “respectful listening to users as theorists and knowledge-makers in their worlds; as actors who if asked can tell you at least something of what they need” (Dervin, 1998, p. 42). As a consequence, there is a need to call for respondent-centered and open-ended techniques to measure knowledge about those issues that are of value to the user.

Snowden shares the same thoughts of Dervin on the nature of knowledge. In his view, knowledge is the sense making capability both to oneself and to the community (Snowden, 2000, p. 241). He admits that knowledge is not only a thing or entity that can be managed and distributed through advanced use of technology, but also a flow that should focus more on context and narrative than on content (Snowden, 2002, p. 101). Both states can co-exist at the same time and he makes use of his Cynefin framework to demonstrate these different states and the flow of knowledge. In the complicated and simple domains, there are best practices and expert knowledge that can be shared with the community. In the complex and chaotic domains, the emphasis is on an open learning culture and environment to breed new and innovative ideas. This concept of diversity is embraced by both Dervin and Snowden.

However, unlike Dervin who states how knowledge can be created, Snowden (2000) attempts “to create an understanding of what it would mean to use knowledge while embracing its ambiguity” (p. 242) and the purpose is to facilitate a user to create meaningful messages that inform other community members to comprehend complex situations without accepting the restraints of a pseudo-rational simplification (p. 243).

More importantly, Snowden (2008a) proposes seven principles of KM, which can be shown in his Cynefin framework. They are deemed useful to this research.

1. Knowledge can only be volunteered, it cannot be conscripted - You can't make someone share their knowledge, because you can never know if they have.
2. We only know what we know when we need to know it – We cannot distinguish in advance what we need to know as an organization. Human knowledge is highly contextual that needs to be triggered by circumstance.
3. In the context or real need few people will withhold their knowledge – It is more important to connect people than storing their artifacts as usually people will not decline a genuine request for help unless there is literally no time or a previous history of distrust.
4. Everything is fragmented - Our brains evolved to handle fragmented patterns such as fine granularity information objects not highly structured documents.
5. Tolerated failure imprints learning better than success - All human cultures have developed forms that allow stories of failure to spread without attribution of blame. Avoidance of failure has greater evolutionary advantage than imitation of success. It follows that attempting to impose best practice systems is flying in the face of over a hundred thousand years of evolution that says it is a bad thing.

6. The way we know things is not the way we report we know things - People use heuristics, past pattern matching and extrapolation to make decisions, coupled with complex blending of ideas and experiences that takes place in nanoseconds. This is different from the more structured process oriented approach that people said they will use when describing how to make decisions after the event.
7. We always know more than we can say, and we will say more than we can write down – The process of taking things from our heads, to our mouths (speaking it) to our hands (writing it down) involves loss of content and context. That is, codification of knowledge will lead to loss of content.

In brief, the conceptualization of knowing and knowledge as a user construction activity that serves as both input and output of sense-making is essential to this study. It provides a strong theoretical framework to study the process of knowledge creation and the elements involved. The emphasis on the actor enables this research to focus on the lived experience of users and to listen to what users really think and feel. Snowden's concept of knowledge also throws light to the need to study the impact of context and the macro environment on knowledge sharing.

3.5 Knowledge Creation as a Verbing and Process Approach

All three scholars concur that knowledge is for action and only by taking actions can one realize the existence of knowledge. Dervin's SMM is a verbing communication practice. As discussed in the above section, SMM conceptualizes knowledge as a constructing activity in the perspective of the actor. Both of these are so dynamic and fast-changing that contemplating them as nouns will only inhibit people from realizing the fact that they are "made, maintained, reified, and changed in communicating" (Dervin, 2003l, p. 106). Nouns

stand for relatively stable interpretations of the reality and imply that there is only one right way to produce knowledge. This is not to preclude the attention to nouns, “but insists that they be examined outside the typical noun-based framework in which the bounds of the inquiry are drawn by researcher assumptions about and definitions of the objects of interests. Instead, Sense-Making conceives of nouns as being constructed by processes, and therefore fluid and open to interpretation” (Spurgen, 2007). Dervin aims to break away from this static noun focus to make SMM a real dynamic process.

To move away from the polarized world view, Dervin uses verbs or actions to point to the fact that the human nature as well as structures and agents are not absolute ontological categories, but are constantly evolving and becoming. It lets people focus on the “movement” of humans between different states when the sense runs out, not the “states” themselves. A verbing approach is to allow us to focus on “changes across time and space and on the flows of events that we can search for and study patterns in the human condition without fixing them tautologically and a priori” (Dervin, 1999a, p. 732). To study knowledge as a phenomenon of human communicating, sense-making focuses on behavior and reconceptualize individual as an entity *behaving* at a moment in time-space (Dervin, 2003f, p. 274). These behaviors are the step-takings, or communicatings, that human beings undertake to construct sense of their worlds (Dervin, 2003f, p. 273). Therefore, verbings are ways to make sense and these verbings “involve the making or using of ideas or both, cognitions, thoughts, and conclusions, attitudes, beliefs, and values; feelings, emotions, and intuitions, and memories, stories, and narratives. For example, sometimes sense-making involves borrowing an idea, sometimes it involves making one, sometimes it involves rejecting one (Dervin & Frenette, 2003, p. 239).

Dervin (1998, p. 39) asks us to look to the gap as it is where action in sense-making and unmaking, in communicating, and in the creating, seeking, using and rejecting of information and knowledge. Hence, the myriad ways of gap bridging or knowledge creating are also conceptualized as verbings. They include a host of strategies including the making of facts or factizing, which most people assume to be a noun only. Other verbings include consensusing, negotiating, power-brokering, defining, hunching, muddling, suppressing, comparing, categorizing, liking, disliking, polarizing, stereotyping, shouting, ignoring, agreeing, disagreeing, attending, listening, arguing, cooperating, contesting, vacillating, reasoning, observing, totalizing, challenging, averaging, exemplifying, authorizing, evidencing, generalizing, personalizing, imagining, experiencing, resisting, relating, picturing, trusting, idea making and idea repeating. In short, the tactics vary according to the gap an individual is facing. They can be sometimes repetitions of ideas used in the past if the new moments are seen as repetitions of the past, and sometimes newly created depending on how the individual defines the new situation. However, some structural constraints such as economic class, income or education can delimit new responses. Therefore, Dervin argues that constancies are found more in the use of channels (e.g. how much a person uses a library) than the use of information (e.g. what a person does with what he or she reads) (Dervin, 2003f, pp. 274 - 275). But it is in the action of gap-bridging in time-space that differences emerge. The pattern may pertain to noun aspects of the human condition or fluidities in sense-making and –unmaking that open up a new kind of theorizing. Actually, SMM “mandates an organizing conceptualization that stands between structure and agency, habit and resistance, flexibility and rigidity. It incorporates them all in a verbing framework” (Dervin, 1999a, p. 743).

The verbing approach posits that communication is a process; sense-making is a process (Savolainen, 1993, p. 16). By privileging processes over outcomes and setting outcomes into

process, each element in the sense-making and sense-unmaking becomes a verb in a set of verbings. These verbs in the hows of sense-making - how people see themselves as moving through life, the gaps they face, and the help they seek - provide a set of universal descriptors that allows comparison of “sense-makings of one human to those of another, of one human to self across time and space” and the emergence of patterns of centrality (homogeneity and agreement) and dispersion (diversity and disagreement) (Dervin & Frenette, 2003, p. 240). This verbing analytics is useful to this research as comparing sense-making across time, space, and people can be more powerfully done and a basis for systematic study can be emerged in SMM.

Like Dervin, Weick (1995, p. 187) also urges people to stamp out nouns. Nouns are perceived to connote concepts of stable entity. Since organizations are never stable, there is nothing about organizations as nouns. In fact, Weick concurs with Dervin to emphasize the need to move away from viewing reality as a collection of static, fixed entities (nouns) to viewing reality as ever-changing entities (Marshall, 2011) and to focus on “process of becoming” rather than the “states of being” (Gioia, 2006, p. 1711). There is no such thing as organization; there is only organizing (Dervin, 2003g, p. 116). Weick goes a step further to give prominence to gerunds or verbal nouns is to highlight his view that organizing is about flows, change and processes (Gioia, 2006, p. 1711). Sensemaking is in fact the process of organizing and it itself is also an ongoing process and the sense made is transient (Weick, Sutcliffe & Obstfeld, 2005, p. 409; Weick, 1995, p. 188).

The use of verbs captures “the action that lays down the path for sensemaking” (Weick, 1995, p. 188). Sensemaking is regarded as “a way station on the road to a consensually constructed, coordinated system of action” (Weick, Sutcliffe & Obstfeld, 2005, p. 409). It is about the

interplay of action and interpretation. Interpretation is about reading a text, but sensemaking involves reading as well as authoring – creating the text (Weick, 1995, p. 7). One of the seven properties of Weick's sensemaking is concerned with enactive of sensible environment. It means that people are part of, and, in fact, create their environment (MacIntosh-Murray, 2005, p. 266). People enact the environment in order to develop a sense of what to do next and to co-construct the environment with fellow sensemakers. Sensemaking is “a matter of thinking that is acted out conversationally in the world as it is a matter of knowledge and technique applied to the world” (Weick, Sutcliffe, & Obstfeld, 2005, p. 412). They quoted an example of how a nurse makes sense by acting thinkingly, by interpreting their knowledge with trusted frameworks and mistrusting those very same frameworks by testing new framework and interpretations. Action is the central focus in the study of person-to-person interaction in Weick's sensemaking (Bakken & Hernes, 2006, p. 1605).

Similarly, Snowden regards the purpose of sense-making is to how we can act in it and argues for the need for organization to build fluid structures responsive to changing and often elusive conditions (Dervin & Naumer, 2010, p. 4701). In his chaotic domain, he emphasizes that the best strategy to deal with the situation is “to act, quickly and decisively, to reduce the turbulence; and then to sense immediately the reaction to that invention so that we can respond accordingly” (Kurtz & Snowden, 2003, p. 469). The ultimate aim is to enable organizations to identify what knowledge they have that leads them directly to action (Browning & Boudès, 2005, p. 36).

3.6 Knowledge Creation in Dialogue and Narratives

Again, all three scholars hold the same view that sense-making must be realized in dialogue and particularly narratives. To Dervin, “knowing is made and remade, reified and maintained,

challenged and destroyed in communication: in dialogue, contest, and negotiation” (Dervin, 2003i, p. 86). Dervin strongly espouses the theory of dialogic communication or communicating communicatively, as spelled out in the following:

Dialogic ideas about communication position communication as dialogue, as a dynamic and complex process through which people create, change, and re-create sense, meaning, and understanding in their interactions with others, media, events, and experiences. A dialogic or communication theory of communication focuses not on homogenizing differences but on putting difference into dialogue and, thus, using it to assist human sense-making. Such a communication theory of communication assumes that when difference is not treated dialogically it appears both capricious and chaotic as if needing homogenization. (Dervin & Huesca, 2003, p. 310)

In order to allow multiple voices to be heard and to accommodate the vast differences in human observations and experiences, the transmission model of communication that conceptualizes the message as the thing to be gotten and perceives the receiver who failed to get the message as deficient must give way to another alternative communication system that is designed for dialogue, as only this kind of system packages messages “as constructions that are tied to the specific times, places, and perspectives of their creators” (Foreman-Wernet, 2003, p. 5), and thus promotes two-way sharing and negotiating of meanings to address differences and contests in human beings’ understandings and experiences (Foreman-Wernet, 2003, p. 6). In other words, communication must be designed to acknowledge people’s everyday sense-makings, and “mandate a procedural circling of the reality being made and remade by citizens from multiple perspectives” (Foreman-Wernet, 2003, p. 12). The move to the verbing approach that pays attention to how people make and unmake sense in the context of their lives in fact “permits dialogic interface to be established” (Dervin & Frenette, 2003, p. 236) as nouns are bracketed to turn the primary focus to the moment of sense-making instead

of the person as the entity. With this dialogic approach that is framed communicatively, Dervin believes that it can avoid the solipsism that results from trying to handle difference non-communicatively and acknowledge that knowledge is something that is contested and negotiated over time (Foreman-Wernet, 2003, p. 12).

Genuine dialogic communication is not possible unless it is designed as such. Dervin proposes to bring a “disciplined approach to communicating”, meaning to develop dialogic procedurings that are reflected in framing research questions, interviewing methods, data collection and analytic procedures as what SMM does (Dervin, 2008a). It also requires positioning the researcher as humbled and dialogically involved (Dervin, 1999a, p. 734). This means that we must trust the informants to have the capacity to articulate knowings from the unarticulated realms of their beings such as emotional, spiritual and embodied unconscious as these are their own struggles in life. They will in fact talk about their confusions and stumblings if the dialogic interface is conducive to trust (Dervin, 1999a, p. 734). In this regard, the researcher should not interpret the worlds for others. Instead, it is crucial for them to act as the vehicle of dialogic practice by asking dialogic questions and listening to how the informants construct her / his concepts, experiences and connections” (Souto, 2010, p. 122).

This dialogic approach operationalized through open-ended interviews leads to the use of narrative analysis. In the interviewing process that focuses on the hows of human sense-making and sense-unmaking, people will be inclined to organize their experiences in terms of plots or stories that reveal their cognitive and affective motivations and contextualize information behavior. Therefore, fitting narrative analysis with sense-making principles will “offer potential for discovering new vistas of information behaviour” (Tidline, 2005, p. 116).

Both Weick and Snowden draw heavily on the use of narratives. This is rooted in the emphasis of both on the role of language in sense-making. Daikar (2011) described Weick's model of organizational knowledge creation as "the transformation of personal knowledge between individuals through dialog, discourse, sharing and storytelling" (p. 74). It underlines communication as the central component of the model. Weick, Sutcliffe, and Obstfeld (2005, p. 413) claimed that the sensemaking, to the extent that it involves communication, takes place in interactive talk and draws on the resources of language in order to exchange through talk. It is the lens through which people make sense of the organization. When people interact and speak, they will gradually develop a shared understanding of the problem and start to flesh out hunches that lead to action. It is the time in which equivocal knowledge is lifted out of the tacit, private, complex, random, and past to make it explicit, public, simpler, ordered and relevant to the situation at hand. Talking and saying is central to organizational action. Thus, Weick argues that sensemaking is an issue of language, talk and communication, whereby situations, organizations and environments are talked into existence (Bakken & Hernes, 2006, p. 1602).

The central role of talking in Weick's theory leads to the dominance of narratives in his approach. In his view, "sensemaking is not about truth and getting it right. Instead, it is about continued redrafting of an emerging story so that it becomes comprehensive" (Weick, Sutcliffe, & Obstfeld, 2005, p. 415). Browning and Boudès (2005) analyzed in details the different ways Weick found narratives important. They commented that storytelling is democratic rather than a privileged concept: anyone can tell a story and anyone can criticize and analyze a story; it does not require any special technical skills for comprehension. Stories can help invoke a personal philosophy of reason, value and action and capture the nuance and uncertainty present in a given situation. Narratives are also valuable for allowing

multiple voices, from marginal to central, to register as a response to complexity because it matches the local, fragmented, emergent story so well. They are needed for people to appreciate disconformity and develop the collective mind in “heedful interrelating” and “mindfulness”. To attend to narratives, Weick also widely adopts observation and interviews in his research.

Stories and story-telling have a special role to play in Snowden’s sense-making. To accommodate diversity, Snowden emphasizes the development of specific alternative procedures for organizational dialogue and stories are valued as the procedural response to complexity. Narrative is seen as a powerful tool within organizations. Snowden (2004) found that stories in organizations reveal patterns of culture, behavior and understanding in a different, and frequently more effective way than interviews and questionnaire-based approaches; allow specific patterns of an organization to emerge in understanding the story of a project and are in turn the means by which it can be patterned (Browning & Boudès, 2005, p. 33); deliver complex ideas in a simple, consistent but not oversimplistic form without loss of meaning or integrity, and convey success as well as failures without the need for direct criticism or admission of responsibility. Kolko (2010) pointed out that Snowden particularly likes to use fictional narrative as a way of positing “what if” scenarios. Participants who work backwards from the fictional end-state to reach the factual present-state will be able to derive the “sensemaking items” from these processes. In a nutshell, Snowden believes that narrative technique is the means for more effective communication.

In this research, Dervin’s Micro-Moment Time-Line Interviewing as will be explained in Section 3.9 was adopted to inform the process of knowledge creation, sharing and utilization in healthcare organizations. The interview is a narrative account of how a healthcare

professional makes sense of his or her gappy situations in the care of his or her patients. Narratives and story-telling will be studied whether they could serve as useful tools in the creation and spreading of knowledge.

3.7 The Need to Attend to Power Issues

Although power issues will exert substantial influence on team working and collaboration (Blackler & McDonald, 2000, p. 833), only Dervin addresses this extensively in her studies. She acknowledges that the issues of force and power pervade the human condition and thus takes the view that the human movement through time-space is both “impacted by the constraining forces of structural power (both natural and societal) and that the individuals themselves in specific situations are sites of power to resist, reinvent, challenge, deny, and ignore (Dervin, 2003k, p. 142). Humans are neither totally free nor totally prescribed. SSM suggests that in order to allow users to disclose what they really think and feel, we need to attend to the power issues, how they interrupt communication in daily practice and to develop procedures to transcend these interruptions.

First, SMM is to energize the in-between. Because there are power differentials in human relationships, people are forced to provide one definitive answer and scared to disagree with those in authority even in face of their own experience. SMM points out clearly that expert views can be entirely wrong, irrelevant, or inappropriate when applied in the contexts of other lived experiences. To hear different voices, we must invite and assist others to speak their worlds in their own contexts. SSM is to mandate attention to “forces that assist or facilitate movement in time-space (e.g., freedom and creativity) as well as those that constrain or hinder it (e.g., structure and habit)” (Foreman-Wernet, 2003, p.8), and emphasizes the importance of putting different voices into dialogue.

Second, to implement the attention to power in research, SMM mandates asking questions that focuses on users' struggles, constraints, barriers, facilitation, hurts, hindrance, motivation, personal power, societal power and their assessments of the relationships between a given moment of sense-making and the power structures of an organization or society. Dervin (1999a, p. 732) also suggests asking not what questions but what if questions – under what conditions does something ensue with what consequences. In the interview process, informants should be made safe to speak out their views. Measures like anonymity are needed. In data analysis, special attention should be paid to the impact of different manifestations of power. For instance, when external forces such as economics constrain the informants, then demographic attributes of users will predict user behavior better. When, however, external forces do not constrain, then situational conditions of use will predict better (Dervin, 2005b, p. 29). SMM also mandates that in systems design, the principle is to seek out sites of maximum agreement as well as maximum disagreement. In short, SMM advocates a utopian approach to place power as the central focus of attention either by bracketing (ie. deliberately setting it aside) or disclosing (ie. incorporating postmodernist deconstructing along with modernist constructing into the informational frame) so that research can break free of any particular assumptions about human rigidities, inflexibilities and incapacities for change (Dervin, 2003i, p. 87).

The importance of power in influencing personal and social relations is also acknowledged by Weick, Sutcliffe and Obstfeld (2005, p. 418) who commented that the power issue can be studied to enhance sensemaking in future. Blackler and McDonald (2000) asserted that there is also direct link between the dynamics of power and organizational learning. The study of Weick and Roberts (1993) on the process of heedful interrelating was cited to illustrate that in high reliability organizations such as aircraft carriers, there is little space for heroic,

autonomous individuals in such complex work settings. In fact, people have to contribute to their work activity, subordinate their actions to the unfolding events to achieve the collective mind (Blackler & McDonald, 2000, pp. 836 - 837).

The attention to power is useful to this research in its study of healthcare organizations in which power is dominant in the relations between physicians and nurses and amongst other healthcare professionals. Thus, the critical inquiry paradigm is taken in this research.

3.8 Individual versus Organizational Sense-making

The power issue also relates to how individual sense-making is related to organizational sense-making. It is obvious that Dervin's SMM stresses more on individual sense-making rather than organizational sense-making. Tidline (2005) had the view that Devin's SMM "may seem inadequate for explaining group and organizational information exchange and communication processes" (p. 114). However, Dervin and her associates refuted. Dervin (2003c, p. 332) argued that gaps existed between individual and structure, person 1 and person 2. Dervin and Clark (2003, p. 170, 171) claimed that the individual moments of communicating as procedure provides the missing energizing linkage between the macro and the micro and connects and disconnects individual, culture, institution, and society. In the following, we will look at the role of individuals in sense-making first before exploring on the linking between individual and organizational sense-making of each sense-making theory.

The importance of individuals in Dervin's SMM is reflected in its bottom-line goal of finding out "what users – audiences, customers, patients, clients, patrons, employees – 'really' think, feel, want, dream" (Dervin, 1998, p. 39). This is the basic assumption that lies at the heart of Dervin's SMM. Throughout her studies, Dervin (2006, p.5) focuses on users in frameworks

that have meaning to everyday actors rather than by imposing frameworks from the viewpoints of experts. This is to understand the realities as seen by users themselves rather than letting experts interpret the world for them. In the words of Dervin (2006, p. 5), if experts are allowed to impose their frameworks, “all we are able to learn is how users see us-looking-at-them”, but what SMM needs is how “them-looking-at-us and them-looking-at-their situations in which they actually or might position themselves as users”. Thus, SMM mandates to position self as the focus of investigation. It lays emphasis on the role of the individual as the expert and theorist of his or her own world. The individual is regarded as the source of expertise. In any sense-making movement, an individual is best positioned to theorize why certain strategies are appropriate for them and hence he or she is involved in designing the new step and developing strategies for bridging his or her own gaps.

To put the individual in the centre of research, SMM aims to “provide a systematic approach to listening to the audience – how they see their situations, past, present, and future – how they move to construct sense and make meaning of these situations” (Dervin, 2003b, p. 223). Not only should listening and hearing be built into the hearts of the research methodology, SMM also emphasizes the need for designing practice that allow users to speak out their “hidden depths”, to articulate their own lived experiences including their struggles and resistances. This is accomplished by means of conscientizing. In the words of Dervin (1999a), “articulating one’s world without limiting it to how it can be easily described by dominant discourses requires a process of bringing the unsaid and unarticulated into consciousness, i.e. conscientizing” (p. 746). Conscientizing is implemented through SMM’s interviewing method that requires framing research questions in such a way that the expertise of the individual participant can be uncovered and his theories elicited (Spurgin, 2006, p. 103). This includes asking the informants the micro-moments of the gappy situation, how they

define them, how they bridge gaps, what has hindered and helped, what conclusions are reached and what insights are arrived, and what they would like to do if there was a magic wand. These users' experiences should also be represented in data analysis and reporting. In contrast to other theories, the data analysis of SMM focuses on the triangle of the sense-making metaphor. Its unit of analysis is smaller than the person – the situation, the gap or question identified at a moment in time-space. In other words, researchers should put into practice an interviewing approach that “does not name the world for the actor but rather mandates the actor to name the world for herself” (Dervin, 1999a, p. 740).

The whole idea above is to “move from a focus on users as nouns ascribed with adjectives of our choosing to users defined as actors navigating moments of situation-facing” (Dervin, 2006, p. 6). Dervin and others (Dervin, 2003e, pp. 66 - 68; Dervin, 2003f, p. 276; Dervin & Clark, 2003) argued repeatedly that this micro moment of behaviors can be considered not only at the micro-level of individual behavior but also at the macro-level of collective behavior. Each individual is situated at cultural / historical moments in time-space that is defined much by culture, history, and institutions. No matter what these macro-level institutions are, there is always a mandate for the individual alone at the micro-level to make sense of the self's relationship to them. Both the individual behavior at the micro-level and its relationship to the macro-level institutions are self-constructions. Thus, Dervin (2003f) argues that “Structure is energized by, maintained, reified, changed, and created by individual acts of communicating” (p. 276). Tidline (2005, p. 113) also supported the view that sense-making will help understand intrapersonal, interpersonal, small group, organizational, national, and global communication practices. This specific moment of behaviors which serves to link the micro with the macro can be applied to both individual and collective entities. The communication-as-procedure framework proposed by Dervin and Clark (2003,

p. 174) illustrates how an individual is related to self and other macro-level entities.

Accordingly, there are six levels of relationship:

- (1) **Individual relating to self:** the individual is thinking, creating, observing, arriving at personal sense and understandings of self.
- (2) **Individual relating to other individuals:** the individual is relating to other individuals, learning about others, comparing self to other, connecting or disconnecting with others.
- (3) **Individual relating to collectivity:** individual communicating focuses on participating in a collectivity which can move as one.
- (4) **Collectivity relating to self:** a collectivity is focusing on itself.
- (5) **Collectivity relating to individual:** a defined collectivity is focusing on individuals.
- (6) **Collectivity relating to other collectivity:** one defined collectivity is relating to another defined collectivity.

These different levels of relationships are termed “situation-defining strategies’, which are understood as the procedure through which the users construct sense of the situation and select any of these strategies that fit the sense made of the situation. Another dimension of the framework is the communicating tactics which are what users attempt to do communicatively in those situations. The framework actually “provides a perspective for looking at any human microworld of individuals is connected to the macrolevel world of cultures, structures, and institutions, and vice versa” (Dervin & Clark, 2003, p. 177). For instance, in a situation requiring an individual relating to other individuals, the individual can apply the tactics or the conversational rules of attending to, sharing ideas with, making decisions, expressing, confronting and mediating with each other. One may also expect how a person creates ideas when relating to self will differ from that individual may do when relating to others. It spells out the “hows” of gap-bridging can be communicated.

The main difference between Dervin and Weick that most scholars note is that Dervin focuses on the individual while Weick puts emphasis on group sensemaking. One of them, Marshall (2011), claimed that Dervin's approach was monadic as contrast to the dyadic and more often triadic or polyadic approach of Weick. This is largely correct at least for the contribution of Weick. Weick's sensemaking also provides a micro-mechanism that produces macro-change over time (Weick, Sutcliffe & Obstfeld, 2005, p. 419). Drawing on Wiley's (1988) four micro-macro levels in social analysis, Weick (1995) argued that "organizing lies atop that movement between intersubjective and generically subjective" (p. 72). Intrasubjective is the self or individual level. It is undoubtedly at the micro-level. The intersubjectivity level is also regarded as the micro-level. It is the level in which "individual thoughts, feelings, and intentions are merged or synthesized into conversations during which the self [intrasubjective] gets transformed from 'I' into 'we'" (Weick, 1995, p. 71). Through interaction amongst individuals, the collective identity becomes emerged. This is the level where sensemaking resides (Weber & Glynn, 2006, p. 1643). Here, Weick did acknowledge individual sensemaker is one of the seven properties of sensemaking - grounded in identity construction. Sensemaking begins with the individual, without whom there would not be any sensemaking. This in turn is influenced by the sense of identity the individual is associated because "Depending on who I am, my definition of what is 'out there' will also change" (Weick, 1995, p. 20). A person that perceived with a different identity will assign different meaning to the same situation. Therefore, "identities specify relationships that are central to the social nature of sensemaking among diverse actors (Weber & Glynn, 2006, p. 1646). That identity will undergo continual redefinition, as it is constituted out of the process of interaction. Thus, a person can have multiple identities representing the individual self or the organization self he works for. Consequently, "the more selves I have access to, the more meanings I should be able to extract and impose in any situation" (Weick, 1995, p. 24).

When the individual sensemaker engages in dyadic interaction with others in a social context, sensemaking occurs at this intersubjectivity level.

Institutions reside at the macro extrasubjective level of “pure meaning”, which is akin to organizational culture. What links the micro-levels and the macro level is generic subjectivity, which is the level of social structure and includes organizations. The defining features are the disappearance of interacting human beings and their replacement by a generic self embedded in structures such as rules, habits and routines. Its function is to define roles that create interchangeability of people and produce premises for action through processes of arguing, expecting, committing and manipulating. In times of stability, the shared understanding at the intersubjectivity level is enacted in the form of rituals, systems, norms and beliefs to keep coordinated action. In times of change, generic subjectivity breaks down into intersubjectivity to arrive at new understandings or modify previous understandings. In both scenarios, generic subjectivity is to create controlling structures to secure stability for the organization. This is Weick’s (1995, p. 170) essence of organizational sensemaking:

Organizations were conceptualized as social structures that combine the generic subjectivity of interlocking routines, the intersubjectivity of mutually reinforcing interpretations, and the movement back and forth between these two forms by means of continuous communication. Tensions between the innovation of intersubjectivity and the control of generic subjectivity animate the movement and communication. The goal of organisations, viewed as sensemaking systems, is to create and identify events that recur to stabilize their environments and make them more predictable.

While both Weick and Snowden focus on organizational sense-making, Snowden does not explicitly deal with individual actors at all, and does not identify any process through which

individual sense-making is linked to organizational sense-making. Weick covers the role of individuals but the link between the micro-level and the macro-level is provided by the generic subjectivity level of social structures. Only Dervin places individuals at the centre and the moments of communicating links them to the macro-level structures. However, Dervin emphasizes that her main difference with Weick is the absence of collective mind:

While the gap idea applies equally well to collective and individual entities, when implemented for the understanding of collective entities it is assumed that there is no collective mind. Rather, it is communicating that energizes the collectivity. Collective gap defining and gap facing are the complex result of individual communicatings. It is not assumed that the behaviors of the collectivity are predictable or explainable solely based on some extrapolation of individual behavior. It is assumed, however, that individual communicatings have something to do with collective communicatings, at a very minimum in the fact that a collectivity lacking a mind cannot act. Individuals act and the collective presence is produced communicatively. (Dervin, 2003e, p. 68)

The literature review in Chapter Two concluded that there is a missing link between individual and organizational knowledge. Devin's deliberation on individual and organizational sense-making and the communication-as-procedure framework provides the direction of how this void can be filled in a more structured and practical way as compared to Weick's. It allows researchers to examine how the gap-bridging strategies differ for an individual in different situations so that how an individual's perspective in a micro situation is connected to the macro world can be merged in the process. This is exactly what this current research is interested to study, therefore, Dervin's communication-as-procedure-framework will be adopted to investigate how the knowledge is created, shared and utilized at

the macro level. Dervin and Clark (2003, p. 182) also mentioned that there was very little academic research in “individual relating to collectivity” which focus on how the individual makes sense of and deals with his or her membership in a collectivity. This is also one of the areas that this research will attempt to study.

3.9 Sense-making as a Methodological Approach

Another significant difference amongst these three sense-making theories is that only SMM provides a metatheoretical model that “moves from a generalized set of philosophic premises to a fully explicated methodology and practice for studying and engaging sense-making” (Dervin & Naumer, 2010, p. 4702). Both Weick and Snowden did not provide any explicit methodology. Weick was often criticized for lacking quantitative or empirical support (Miner, 2006, p. 103). His research usually makes use of case studies coming from his field studies of jazz orchestras, firefighters, aircraft carriers and power plants. He usually starts with theory to research practice and use the research result to amplify his theoretical ideas (Dervin & Naumer, 2010, p. 4700). Snowden’s works are mainly based on action research. Browning and Boudès (2005, p. 33) stated that Snowden presents his ideas to workshop participants, and then uses an interpretation of their responses as evidence for his concepts in his articles about narratives and complexity. He will then apply them directly into his practice.

For Dervin, what sets her SMM apart from others is that it provides a coherent set of meta-theoretical assumptions, specific research methods that guide the design and implementation of communication research practice in framing research questions, data collection and data analysis. Dervin found that the term methodology was used loosely in scholarship. It is either collapsed into mere methods or quantitative methods in objectivist / scientific study or collapsed into metatheory or qualitative approaches in subjectivist / humanistic study. The

former privileges substantive theory while the latter privileges metatheory. Metatheory consists of philosophical grounded assumptions about the phenomena and about how to study it so as to guide researchers in constructing theories proper (Dervin, 2005b, p. 25; Kari, 1998). Substantive theory is the most concrete form of metatheory. It is a set of inductively and / or deductively derived concepts and their interrelationships that provides an explanation for certain phenomena to guide researchers in constructing specific research questions as well as hypotheses (Dervin, 2003k, p. 137; Kari, 1998). Unlike metatheory, a substantive theory is empirically testable. In both cases, “there are yawning gaps that remain between assumptions and the hows of methods” (Dervin, 2008a, p. 4).

Dervin does not favor the above all-or-none approach. SMM assumes that the reality is orderly in part, chaotic in part and evolving in part. Similarly, the humans are sometimes static across time-space and sometimes fluid across time-space. It is erroneous to assume in advance which across time-space characteristics account for individual as well as collective sense-making. Consequently, there is no one single method to studying this elusive human condition. Rather, SMM emphasizes that its methodology is “to *unearth the conditions* under which users turn to habit versus when they turn to behaviors linked more consequentially to particular contextual conditions versus when they turn to trying out new approaches” (Dervin, 2006, p. 8) (Emphasis added). The is exactly the purpose of this research which is to find out conditions under which knowledge can be created and under which knowledge will not be created.

To bridge the gap of the all-or-none approach and to enhance the systematic research of human conditions, Dervin turns to develop SMM as a “methodology between the cracks”, an “in-between” approach that takes both the quantitative and qualitative approaches without

admitting any determinism embedded in method. SMM from the beginning has mandated itself to operate simultaneously in four planes of meta-theory, substantive theory, methodology and method such that the methodology-method connection is reflected by and reflects that connection between metatheory and substantive theory (Naumer, Fisher, & Dervin, 2008; Dervin, 2008a, p. 4). Methodology is broadly conceptualized as the relationships between the actual research methods used in any given situation and the substantive theory that direct those methods as well as to the metatheory that the entire research edifice rests. It forges explicit bridges between metatheory and method, for the practices of research and theorizing (Dervin, 2003k, p. 138). It involves the reflexive analysis and development of methods – with methods defines broadly as the specific “hows” of theorizing, observing, data collecting, analyzing, and interpreting (Dervin, 1999a, p. 728; Dervin, 2003k, p. 137). In this sense, SMM not only is a metatheory but also provides guidance for method, including methods of framing research questions, methods of interviewing, and methods of analysis, all relating to substantive theorizing and of conducting research not anchored in any specific context but applicable to any setting relevant to the communicative study of communication – the constructing that humans do to make sense of their experiences. Knowledge creation is defined by Dervin as a communication practice. Thus, the methodological approach of SMM will be adopted in this research. This is covered in the following section.

3.9.1 Methods of Interviewing and Data Collection

The methodological approach of SMM that is to reflect its metatheoretical assumptions reviewed in the above section is implemented through the graphical tool, the Sense-Making metaphor, which serves as a generalizable microscope guiding the observation of communicating (Dervin, 2005b, p. 27). Interviewing is the primary research tool to apply

SMM's methodological approach. Thus, its practices are also derived from the same SMM metaphor. Figure 3.7 below is the fully-developed version in 2008. What it differs from Figure 3.1 in p. 164 above is that the sense-maker now carries with an umbrella labeled as "Context". It refers to macro-level structure, culture, person, situation, behavior, organization and so on (Dervin, 2003g, p. 112). The sense-maker representing the agency that holds the umbrella moves with the umbrella can act inside, outside and against it. This sense-maker, applying to any entity, no matter it is an individual or a collectivity, moves through time-space in its entirety in 6Hs – head (cognitive knowing), heart (emotions), hand (body), habit (repertoire building), hegemony (hidden forces of power) and habitus (communicating practice inscribed by hegemony) implying that in SMM it is impossible to separate the inner and outer worlds of the sense-maker. In facing the ever-present gappiness by mandate of the human condition, the sense-maker has to cross over it by building bridges that can be unconscious repetition of the past or new construction when the old sense has run out. This is the sense-making moment in which new knowledge will be created and is of particular interest for this research. It does not mean that all gaps are problems and not all gap-bridging are problem-solving or decision-making. There are many gap-bridging strategies and tactics, all involve internal and external verbings encompassing not only thoughts, ideas, observations, understandings but also emotions, feelings, dreams, visions, pretenses, illusions, connections and disconnections. But no matter what tactic is used, it has consequences for the kind of idea created, and the kind of idea created has implications for the tactic used (Dervin, 2003f, p. 274). The sense-maker may also need to make use of different sources of inputs such as own ideas, information, documents, databases, and peers depending on their relevancy to the situation and gaps he or she is facing. The outcome of bridging the gaps is to get either helps or hurts, which provides another fodder for the situational conditions of the new moment in time-space.

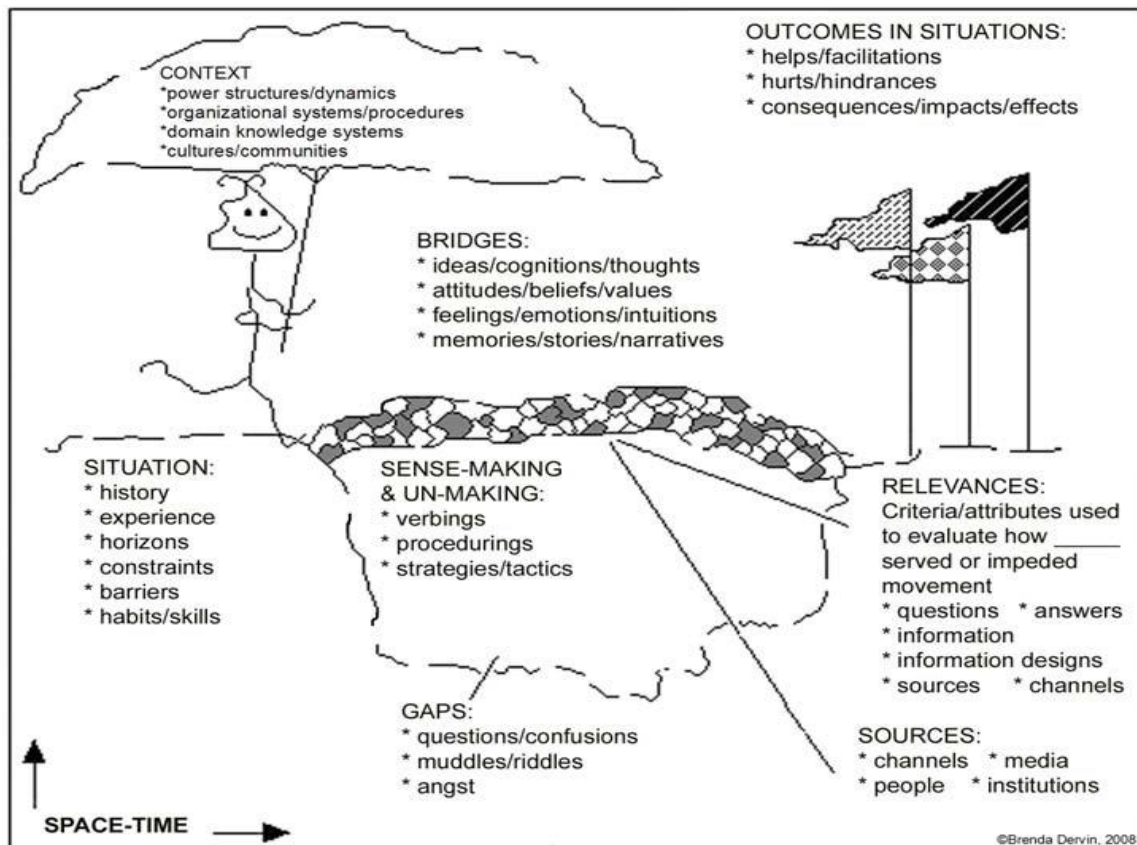


Figure 3.6 The Sense-Making Metaphor (Dervin, 2008a, p. 17)

This Sense-Making Metaphor is not a literal map or model, but a metaphorical framework that “is intended as a highly abstract methodological tool, a way of looking” (Dervin, 2003k, p. 151). Each step-taking across the gaps in the metaphor represents the central foundational concepts of SMM that mandates attention to these primitive terms – context, time, space, movement, gap, horizon, situation, bridge, history, energy, power, experience, constancy (habit, inflexibility, rigidity), change (flexibility, caprice, chaos), outcomes, helps and hurts. Together they constitute what Dervin (1983; 2003f, p. 278) called the Sense-Making Triangle of situation-gap-outcome shown in Figure 3.7 below that informs how interviewing is practised. All interviewing approaches of SMM focus on the micro sense-making moment anchored in a particular time-space – the intersection of all parts of the situation-gap-outcome - in order to capture all step-takings. The purposes are to hear what informants really think,

feel, need, experience and struggle with on their own terms, to facilitate the emergence of multiple perspectives so that different voices including the hidden and silenced can be heard but not homogenized, and to elicit from informants situated narratives of their internal and external movements through time-space that may be used for both qualitative and quantitative analysis (Dervin, 2008a, p. 15; Dervin & Naumer, 2010, p. 4703).

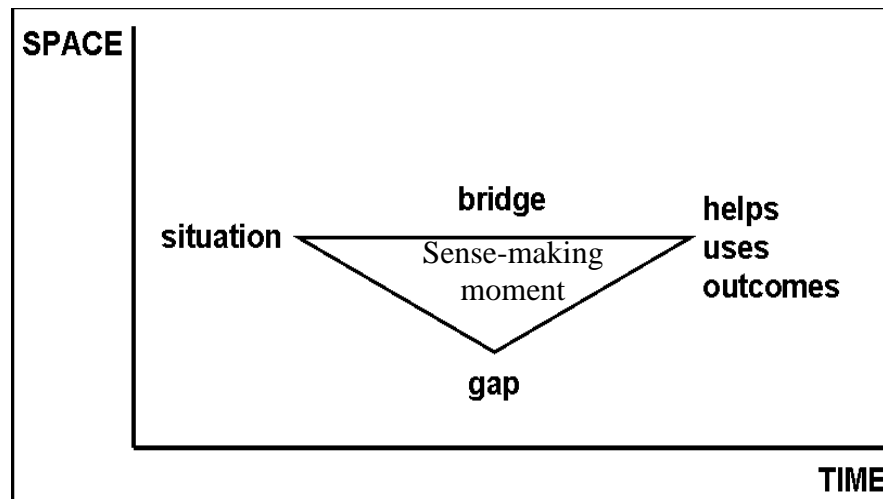


Figure 3.7 Sense-Making Triangle of Situation-Gap-Outcome

To achieve the above purposes, SMM stipulates a core set of fundamental mandates to conduct interviews (Dervin, 2008a, p. 15):

1. Minimal intrusion by researchers of their credentials and expertise.
2. Giving informants permission to not be representatives of collectivities but to be aware observers of collectivities.
3. Understanding that informants do not come to interviews with answers on the tips of their tongues, or even well-articulated in their minds.
4. Having informants talk only about situations real to them, that they have experienced. This has proved to be most effective in eliciting what the users really think and feel.
5. Understanding that “real” to informants does not mean objectively real. Observations of how brutally imposed power hurts is “real” to informants but so are informants’ dreams of what would have helped and explanations of causes and consequences.

6. Interviewing to build trust and willingness to disclose by implementing an interviewing approach focusing on the verbs of communicating in order to reach for an understanding of the elusive noun worlds of informants as seen by informants.
7. Allowing informants to be the same and / or different as they move across time-space.
8. Allowing informants to be confused and muddled; and at the same time intelligent and strategic.
9. Allowing informants to see situations outside the boxes of our frameworks.
10. Allowing informants to be aware creators of their worlds.
11. Understanding that precision in question-asking may be less important than trust building and treating informants as individual sense-makers.
12. Using redundancy during interviewing as an important communication tool for building the bridge between informant stories and researcher understandings.
13. Inviting informants to talk about their situations in terms of how they are constrained and free of and freed by multiples forces – their own, those from others, those from structures.

These interviewing principles are useful to researchers with the genuine interests in adopting and applying SMM in their research. In this research, I have also designed appropriate measures to implement these mandates. This will be elaborated in Chapter Four.

There are many interviewing methods in SMM that can be administered in numerous ways including in-person, by phone, online, one-on-one, focus groups, surveys, participant observation, ethnographic studies, self-administered or interviewer-administered (Dervin & Frenette, 2003, p. 241; Dervin & Naumer, 2010, p. 4703). The common core of them is to examine varying brackets of time-space as experienced by the interviewee in the moving through an experience, with each time-space bracket being conceptualized as another micro-

moment of their lived and / or phenomenological experience (Dervin, 2008a, p. 20). Since the interviewee may have multiple time-space brackets in an experience, SMM interviewing is designed to allow circling and re-circling of each sense-making moment in different ways depending on the research, application or context as captured in Figure 3.8.

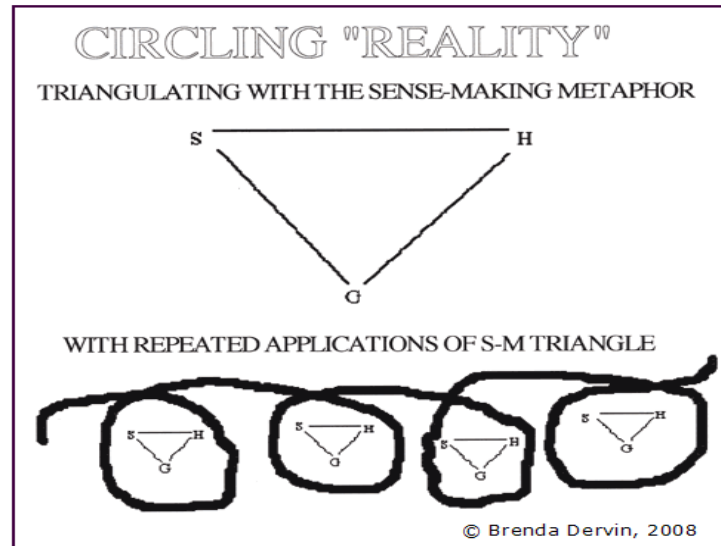


Figure 3.8 Circling reality (Dervin, 2008a, p. 20)

The Micro-Moment Time-Line interview is the most foundational interviewing approach of SMM. It requires the informant to describe a situation relevant to the research focus and then each step in detail in Time-Line steps – what happened first, second and so on (Dervin & Frenette, 2003, p. 241). For each Time-Line step, the informant is directed to the Sense-Making Triangle by circling the micro-moment at specific points in time in terms of how the informant saw the situation, the gap and the help he or she wanted (Dervin, 2003f, p. 279). This SMM Triangle can be applied to each micro-moment or more if there is a need to dig deeper in some specific areas such as a certain conclusion, the gap-bridging tactic, etc. This interviewing approach allows the informant to create his or her own context and to fully inform the interviewer about his or her own world (Dervin, 2003a, p. 257). In actuality, many variations have been developed to suit different research needs. There are: Micro-Element

Interview that focuses on only one step; Life-Line Interview that surveys the entire lifeline of experience vis-à-vis an issue; Helps Chaining Interview that focuses on how the informant “constructs the connection between information, system, or structure and self” (Dervin, 2003f, p. 281), and focus group interview. But no matter which interviewing approach, all are guided by a roster of questions for each element in the Sense-Making Triangle.

3.9.2 Framing Research Questions

To allow the informants to speak for their own worlds, SMM mandates researchers to ask questions in a verbing approach and to silence their own nouns and instead focus on the universals of human movement through time space (Dervin, 2008a, p. 19). These so-called SMM questions are all open-ended with prompts at specific points the researcher sees fit. For each element of the Sense-Making Triangle, there is a roster of questions that can be used or modified to be used depending on the research context. SMM also mandates repeated use of these questions as redundancy is key to get more understanding of the informant’s worlds and to allow time for the informant to think deep. Here are a few examples (Dervin, 2008a, p. 19):

To tap situations:

1. What happened?
2. What stood in the way?
3. How did that connect with past events?
4. How did it connect to forces of power in family, community, society?

To tap gaps:

1. What were your big questions?
2. What questions, confusions did you struggle with?

To tap bridges:

1. What conclusions / ideas did you come to?

2. What emotions / feelings did you come to?

To tap outcomes:

1. How did that help?
2. How did that hinder?
3. If you could wave a magic wand, what would have helped?

3.9.3 Methods of Analysis

Data analysis in SMM aims at identifying patterns of sense-making across time-space in terms of universal categories, particularly at “how informant sense-making varies across time and space; for both stabilities and habits as well as flexibilities and changes; for connections between past, present, and future, and at how the informant sees self as constrained and struggling as well as moving and free” (Dervin & Frenette, 2003, p. 241). The resulting pattern will allow comparison of the sense-makings of one human to those of another, of one human to self across time and space, and will yield patterns of both centrality (homogeneity and agreement) and dispersion (diversity and disagreement) (Dervin & Frenette, 2003, p. 240). To accomplish this, Dervin found it necessary to avoid focusing on the noun experience of the informants and imposing the noun judgment of the researchers. Thus, she introduced a verbing interface over the noun interface to focus on the sense-making moment such as how his or her movement can be stopped (as a perspective for looking at situational conditions), the kinds of gaps need to be bridged in order to keep moving (as a perspective for looking at sense-making or information needs), and the different ways for evaluating the success in gap-bridging (as a perspective for looking at information use or actor-created effects of information-sharing and communicating)” (Dervin, 2003a, p. 255). The focus of analysis is thus not on the person, but on the micro-moment of sense-making. Consequently, the unit of analysis in SMM is informant-in-situation which is smaller than the person. These

informant-in-situations can be any or all of the components of the SMM metaphor – situational condition, the gap, the bridge or the outcome depending on the research objective. In SMM, these are to be measured by a set of universal descriptors which are proved in the 40 years of projects of Dervin and her students in providing a better understanding of the informants’ sense-making than the traditional constant attributes across time-space like demography and personality. These universals are to be derived from content analysis by intersecting a deductive set of frameworks based on Sense-Making’s verbing analytic with the inductive qualities of the data (Dervin & Frenette, 2003, p. 242). They are then used to code the interviewing narrative for both qualitative and quantitative analysis. Again, it shows that SMM is a methodology between the cracks. Various studies of SMM (Dervin, 2003a, pp. 260 - 264) provide many such universal category of measurement for situations, gaps, gap-bridging strategies, helps, and so on. One example is the category “Situation Movement State”, which aims at taping how the informants see their movement through time-space being stopped. There are 11 such states: decision, problematic, spinout, washout, barrier, being led, observing, out to lunch, waiting, time passing, and moving.

3.10 Conclusion – Theoretical Framework for this Research

This Chapter compares and contrasts the sense-making theories of three leading scholars, Dervin, Weick and Snowden, in different perspectives. They all recognize that knowledge is created in the constructings and sense-makings. A verbing and dialogic approach should be taken to capture the importance of action and dialogue particularly narratives in sense-making. All share the need to work in an environment with complexity and uncertainty and the importance to facilitate diverse voices to be heard. Narratives and storytelling are effective tools to organize and contextualize individual experience, and is the way to maximize the sense-making’s explanatory power.

However, their differences are even greater than similarities. Only Dervin's SMM looks more promising to provide a sound theoretical framework for this research. The following is a summary of the contribution of SMM to this research in addition to the above:

1. The conceptualization on the nature of knowing and knowledge as the sense made and as the input as well as output of sense-making provides the basis for this research. By looking to the gap idea in the sense-making metaphor of situation-gap-outcome, one will find the moment under which knowledge creation and utilization can take place. By studying the gap-bridging strategies, one will know the hows and whys knowledge is created, shared and utilized. SMM allows this research to look at sense-making of healthcare professionals to map out the whole process of knowledge creation, sharing and utilization.
2. Its universal variables of sense-making for predicting sense-making, information seeking and use provide another useful alternative to the traditional transmission model. Its focus on the situated behavior in sense-making allows this research to study all knowledge, sharing and utilization as a situated practice. All the elements involved in this process can also be examined.
3. It acknowledges that knowledge creation is a communication practice, the purpose of which is to find out what users really think and feel. An individual is put at the center of its conceptions. The emphasis on an individual enables this research to focus on the real-life sense-making experience of healthcare professionals at a micro-level and the process of knowledge creation and utilization can be understood in this way.
4. Its emphasis on power is particularly useful to this research as healthcare setting is highly sensitive to power issues.
5. Besides focusing on individual knowing at the micro-level, SMM also claims itself applicable to the study of the relation between micro and macro levels. It is argued

that the specific moment of sense-making behaviors provides exactly the missing procedural link between the two. Its communication-as-procedure provides a structured and systematic means to study this relationship.

6. SMM provides a coherent and complete set of methodological approach based on her metatheoretical assumptions including guidance for methods, interviewing approach, framing research questions, data collection and analysis. I echo with Souto (2010, p. 117) that this bridges the distance between theoretical assumptions and research method. This is not found in the approaches of Weick and Snowden.

It is clear that Dervin's SMM is significant to this study in many essential ways. Thus, it will be adopted in this research as the basic research framework through which the knowledge creating process in the micro and macro level of a healthcare organization is investigated. The Cynefin framework of Snowden for organizational sense-making will be taken to supplement the data analysis. The emergence and flow of knowledge in different domains proved useful for the understanding of the limitations of EBM and its failure to assimilate the humanistic dimension of clinical practice. The role of narratives and storytelling in knowledge sharing will be explored. However, Weick's sensemaking theory has a number of weaknesses that limits its application in this research. These include the retrospective nature of sensemaking, the resulting implication of the impossibility to make sense of situations not occurred before, the restrictive view of imposing order out of chaos, and the lack of testable empirical data and methodological connection to the three-part process of enactment, selection and retention. Chapter Four delineates in detail how Dervin's SMM is applied to this research.

CHAPTER FOUR

RESEARCH METHODOLOGY

To admit that knowledge is intrinsically erroneous is not to imply that we should forego it.

McGuire

If you can't measure it, you can't manage it.

David Garvin

4.1 Introduction

This research aimed to find out how knowledge might be created, shared and utilized in healthcare organizations and in what ways the research-practice gap of EBM can be bridged through knowledge management. In addition, the linking of individual knowledge at the micro-level to the organizational knowledge at the macro-level was also be explored. Essentially, the findings from the research were analyzed to derive concepts that could be added to or removed from the Sense-Making model of Dervin and a new micro-macro sense-making model built on these findings to identify factors that would enable or block these sense-making activities. Thus, healthcare information professionals can design relevant products and services to facilitate the process and to reduce the impact of the stumbling blocks. Chapter Two outlined the clear trend towards a communicative approach in KM research that reflects the interpretive and critical inquiry perspectives taken in this research to derive the working definitions of knowledge and KM. In fact, this perspective of viewing knowledge as both subjective and social is more amenable to the sense-making approach than other interpretive philosophies. The comparison of the three leading sense-making theories in Chapter Three concluded that Dervin's SMM is particularly relevant as the research framework for this research and it would be supplemented with Snowden's Cynefin

framework in data analysis. Dervin's SMM is a coherent methodology based on her metatheoretical assumptions that provides guidance for methods, interviewing approach, framing research questions, data collection and analysis. This Chapter details how the study of knowledge creation, sharing and utilization is designed as informed by Dervin's SMM.

4.2 Sense-Making Methodology

The extensive review of the leading sense-making theories in Chapter Three explained in details the various reasons why Dervin's SMM provides a sound theoretical framework for this research. To recap briefly, knowledge is understood as the sense an individual has constructed at a certain moment in time-space (Dervin, 1998). Whenever individuals encounter discontinuity, they can make use of the old sense to cross the gap. However, when the old sense runs out, they need to define this gappy situation and decide what knowledge or other inputs are required to clarify this unclear aspect of the situation or to build a new bridge. Here, gap-bridging can be viewed as "the constructive process where an individual draws on cognitive and affective resources in order to cross the gap being faced" (Savolainen, 1999, 78). Or as Kari (2001, p. 32) remarked, gap bridging can be translated into information seeking, and bridge into "knowledge". The individual engages in various internal and external behavior including observings, thinkings, idea creations, comparings, contrastings, rejectings, talkings, sendings, agreeings, disagreeings, and so on to make use of various inputs ranging from "ideas and cognitions, feelings, emotions, questions and muddles, angst and hunches, dreams and wishes" to "observations and understandings, visions, pretenses and illusions, connections and disconnections" for constructing the bridge (Dervin, 2003f, p. 273; 1999a, p. 730). The new sense made in this process constitutes new knowledge for the individual. The actor in this process can be any type of entity – individual, group, organization, or even society. The moments of communicating of the actor with other

individuals or collectivity serve to link the micro world of the individual with the macro world of structures, culture and institutions, enabling the study of knowledge creation, sharing and utilization at the macro level. It is clear that by employing SMM to study the constructing that healthcare professionals do to make sense of their experience in work, we are able to derive from such study the process of knowledge creation, sharing and utilization in a healthcare setting.

SMM is not just a theory, but a methodology that contains a coherent set of research methods that guide the design of research questions, data collection and data analysis. Time-line interviewing is its main research tool. It can be said that Sense-Making methods are derivations of the theory (Dervin, 2003f, p. 279). Since SMM is the theoretical framework for this research, it is essential for this research to adopt the research method that mirrors its theoretical framework so as to derive a complementary substantive theory.

Moreover, this research is in the main an exploratory and qualitative study, though quantitative analysis will be conducted to supplement the findings. Schamber (2000, p. 744) highly recommended time-line interviews for exploratory studies. She also remarked that the flexibility of the method in the sense that time-line interviewing can be adapted to focus on any situational area of interest also made it suitable for qualitative and exploratory studies. Sense-making experience is very personal and subjective. Time-line interviewing provided the means for the interviewees to reveal what they really think and feel about the situation. In a nutshell, the in-depth interviewing approach developed by Dervin is the best instrument to use in this study as compared to other data collection means such as open-ended questionnaires. In fact, my experience echoes that of Cheuk (2000, pp. 74 - 77) who found that only Dervin's interviewing method overcame the problems she encountered with other

data collection methods attempted in her pilot studies to capture the information seeking situations of her respondents.

Amongst the various time-line interview methods of SMM, the core one, Micro-Moment Time-Line Interview, was selected because it is the most comprehensive, in-depth and detailed method amongst other variants of this approach. The Micro-Moment Time-Line interview starts with one sense-making situation the interviewee has experienced before and which also falls within the scope of the research. This situation is the so-called critical incident that serves as the entry point for the interview. Being critical, it is not an ordinary event, but one that has great impact on the interviewee or is so critical, perplexing or confusing that it left a deep impression on the interviewee, making him or her easier to remember. The interviewee is then asked to recall what happened in that situation, which constitutes the time-line steps, and to describe what happened first, what happened next, and so on, until the details in each step are covered. For each step in the time-line, the interviewee is directed to focus on “Sense-Making Triangle, circling the micro-moment in terms of how the actor saw the situation, the gap, and the help he or she wanted – that is, where he / she wanted to land after crossing the bridge” (Dervin, 2003f, p. 279). As SMM is to allow the emergence of the actor’s own perspectives in their own terms without any obstruction, the interviewee is free to select “what time-space moments to attend, how to attend them, how to order them, how to collapse and / or expand time-space in the ordering, and how to connect one time-space moment to another” (Dervin, Jacobson, & Nilan, 1982, p. 428). There are neither hypothetical questions to respondents nor any elaborate lists of options to which respondents must reply (Kim, 2005, p. 485). Unlike conventional critical incident or explication techniques (Urquhart et al., 2003), SMM interviewing focuses far

more on the individual within the situation, and their perceptions of the situation and less on the situation itself and how the situation unfolded.

Depending on the research purpose, additional elements can be examined and stressed. Dervin illustrated this methodology by using studies of information needs as an example. She (2003f) said, “Emphasis has been placed on understanding how the individual saw self as stopped, what questions or confusions he or she defined, what strategies he or she preferred for arriving at answers, what success he or she had in arriving at answers, how he or she was helped by answers (i.e. how she or she put the answers to use), and what barriers he or she saw standing in the way to arriving at answers” (p. 279).

One of the strength of this interviewing approach is that it enables a rich description of the interviewee’s experience in a highly structured manner yet independent of content (Dervin, Jacobson, & Nilan, 1982, p. 429). The interviewer provides the structure based on the Sense-Making Triangle. The interviewees in turn provide the content at the level of details they pick.

4.3 The Research Setting

This study is to investigate the knowledge creation, sharing and utilization in healthcare organizations in order to shed new light on the practice of EBM. As informed by SMM, knowledge creation is a situated practice. Healthcare professionals were invited to share their real life experience in the care of patients or handling other hospital work that produced perplexity, ambiguity or uncertainty so that the gappy situations they have encountered before, the strategies they employed to define and bridge the gaps with the available sources of inputs, and the helps or hurts they got, can be studied. It goes without saying that the

research setting is hospitals. This study was conducted in Hong Kong. Health services in Hong Kong are delivered by both public and private providers. The following diagram illustrates the health service delivery infrastructure.

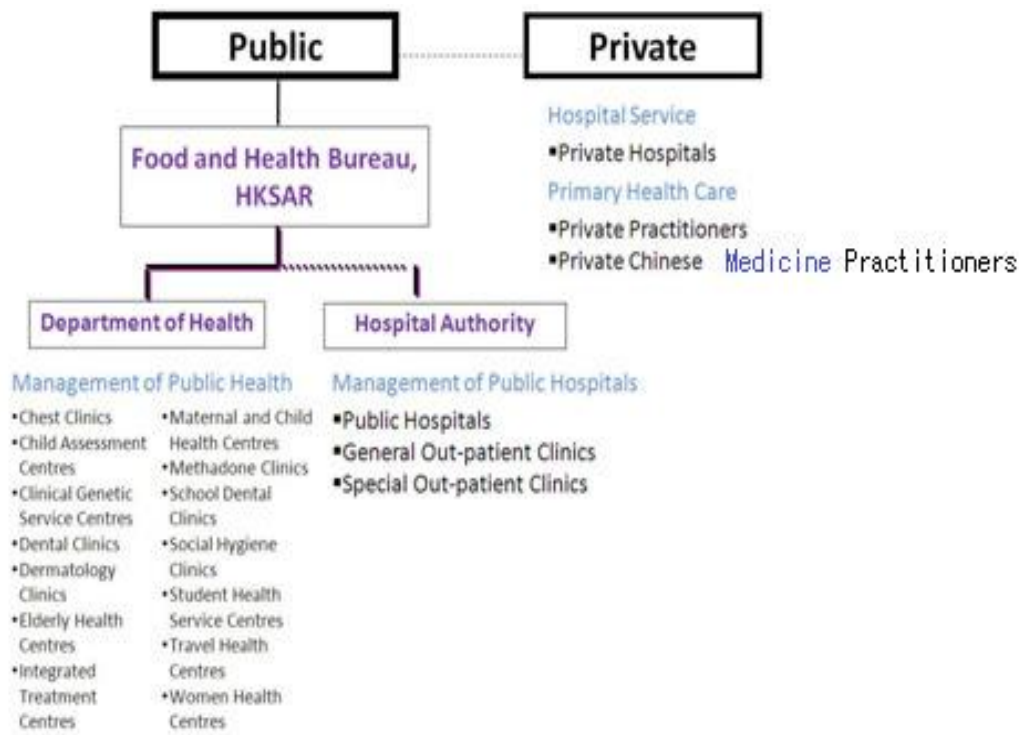


Figure 4.1 Health Service Delivery Infrastructure (WHO & Department of Health Hong Kong, 2012, p. 5)

The Department of Health is a government department that is responsible for health promotion and disease prevention services. Its counterpart, the HA, was established in 1990 as the statutory body for managing all public hospitals and institutions and their services to the community (Hospital Authority, n.d., para. 1). These services are highly subsidized. Since 1991, HA has taken over the management of all public hospitals from the Government. Currently, it has a workforce of around 64,000 people that spread across 42 hospitals and institutions, 48 Specialist Out-patient Clinics and 73 General Out-Patient Clinics (Hospital Authority, n.d., para. 2). In 2010 / 11, the HA delivered 90% of total in-patient bed days

(WHO & Department of Health Hong Kong, 2012). In addition, the HA strongly supports EBM practice and KM concepts and has began to implement them since the 1990s. According to Cheng (2006),

The HA promoted evidence-based philosophy since 1998, and set up the Clinical Effectiveness Unit (CEU) and the Knowledge Management Unit in 2000 to institutionalize EBP initiatives. The efforts culminated in the launching a KM platform, with comprehensive web-based resources – the e-Knowledge Gateway (eKG).

Although the interview did not ask the respondents in the HA to talk about EBM and KM directly, their first-hand experience with these may have an impact on the care of patients, particularly in times when they encounter gappy situations. With this background in EBM and KM, and the important role played by the HA in the provision of health services in Hong Kong, public hospitals are considered as the representative sites that must be included in this study.

The private sector at the time of study mainly consisted of 12 private hospitals and various private clinics that deliver a wide range of services including general and specialist out-patient services, day care services and in-patient services under various specialties. Most doctors in private clinics will attach to one or more private hospitals. Although they only accounted for around 10% of total in-patient bed days in 2010/11, about 70% of outpatient consultations are provided by the private sector in out-patient clinics attached to hospitals, clinics or stand-alone facilities (WHO & Department of Health Hong Kong, 2012). In addition, approximately 49% of registered medical practitioners practiced in the private sector (WHO & Department of Health Hong Kong, 2012). The institutions in the private sector are also significant in health service delivery in Hong Kong. There is no literature

reporting that private hospitals and clinics in Hong Kong implemented EBM or KM. Thus, this difference may provide a contrast with the healthcare professionals in public hospitals. Interesting factors may come up about the implementation of KM, particularly the success factors such as the cultural factors. Therefore, it was decided to include healthcare professionals either working in or attached to private hospitals via their own clinics.

There are many specialty wards in public hospitals. The internal medicine wards and general surgical wards including Intensive Care Units (ICU) receive the greatest number of patients. They are also general in nature with many different cases and all hospitals regardless of their nature will establish these wards. Nevertheless, they will cover a range of specialties from cardiology, neurology, gastroenterology, neurosurgery, and colorectal surgery to Ear, Nose and Throat (ENT). In addition, the staff members in such wards constitute a large proportion of healthcare professionals in a hospital and thus the results of the research can probably be generalized to other specialties too. With the greatest number of healthcare professionals working in these two kinds of ward, it was also deemed easier for me to find respondents. Therefore, these two wards were chosen as the study sites.

Two groups of professionals, doctors and nurses working in the same ward, were selected as the participants. The professionals working in the same ward can be viewed as members of a community of practice, as they have very similar background and training and thus knowledge and skills in the same specialty. It can be said that they have the same domain of interests, engaging in the same work activities, and possess the same medical practice (Wenger, 2000; 2006). It would be easier for them to establish shared meaning about the care of patients with more opportunities for knowledge creation. With similar background, the gappy situations they encountered and gap-bridging strategies are more amenable for

comparison and generalization. The allied health professionals were not included as they are not attached to a ward in Hong Kong. The same two groups of professionals working in these two wards in the private sector were selected. However, many of the doctors have their own private clinics. Thus, the selection of respondents was not limited to private hospitals only. Those working in private clinics were also included.

4.4 Sampling Strategies

Since the research aims at looking for doctors and nurses working in internal medicine or general surgery wards in either public or private hospitals in Hong Kong, nonprobability sampling was used. By this sampling method, the selection of samples is not based on a random process that will map out a representative subgroup of the larger population, but on the human judgment of the researcher. It does not require a list of all possible elements in a full population. Instead, researchers are allowed to access otherwise highly sensitive or difficult to reach study populations in a focused way (Berg, 2007, p. 43).

As compared to probability sampling, nonprobability sampling will inevitably generate a biased sample. But there are both theoretical and practical reasons for this research to employ this method. First, for theoretical consideration, Hayes (2005) advised that the sampling method used should depend on what kind of inference the researcher wants to make from the samples. Non-probability sampling is best for making a process inference, which is usually the primary interest of most communication researchers. Process inference means that the research is more interested in testing a theory or a hypothesis (for example, if this happens, then something else will / will not happen). The research focus is to make an inference about the process at work rather than the specific size of an effect in some

population from which the sample has been taken. In his view, random sampling is not required for process inference.

If the researcher does not want to make a specific statistical statement about a population (such as females are 2.3 units more shy than males on average), then the question of whether the sample is random or not becomes moot. If the intent of the researcher is not to make a population inference but instead make a process inference, then the origin of the sample should loom less large in our evaluation of that research. (Hayes, 2005, p.41).

This research is also focused on process inference. It is an attempt to study the knowledge creating process in the healthcare context and the generalization of this process. The focus is not the individual healthcare professional but the individual-in-situation. Since the generalization from the samples to the population was not undertaken, it was considered appropriate for this research to use a nonprobability sampling method.

Second, for practical considerations, the procedures of nonprobability sampling to select samples are much easier, quicker and cheaper when compared with probability sampling. Amongst the available nonprobability sampling methods, purposive sampling or theoretical sampling was employed. Also known as judgmental sampling, purposive sampling refers to the selection of samples that relies on the special knowledge and expertise of the researcher about the population to evaluate whether the samples are able to meet particular research goals or whether they are likely to epitomize the analytic criteria required in the study or to provide variation (Berg, 2007, p. 44; Warren, 2001, p. 87; Bazeley, 2013, p. 49). The process of finding respondents is an ongoing one until the emergence of meaningful patterns for comparison can be made (Bryman, 2004, p. 544). As explained in Section 4.3 above, the criteria to recruit samples in this study are that they must be either doctors or nurses working

in the same internal medicine or general surgical ward in either public or private hospitals in Hong Kong, on the grounds that these people would share similar background and training and thus have more opportunities for knowledge creation and sharing. I have the personal network for contacting doctors and nurses working in public hospitals. At the time of research, I was the medical librarian of the Medical Faculty of a local university. The Medical Library in which I was working is located in a large public hospital which is also the teaching hospital of the Faculty. Prior to this job, I also worked in various hospital libraries in the HA for a number of years. This relatively strong network enabled me to recruit samples more conveniently by purposive sampling as access was less problematic with known contacts. These professionals also referred me to other healthcare professionals that have the relevant experience to share, reducing some sampling bias. In view of the research needs of this study and the ease of access to the respondents, purposive sampling together with snowball sampling was the obvious choice of sampling method for this study.

4.5 Recruiting Participants

Based on the sampling strategy established above, potential participants should come from both public and private hospitals. The first decision to make was how to approach the public hospitals, which have the greatest number of potential participants.

There are 42 public hospitals in Hong Kong and all are organized into seven hospital clusters according to their locations in order to ensure that patients receive a continuum of care from acute care to convalescence and rehabilitation, and community after-care within the same location. This is achieved through well-coordinated division of services within the hospitals in each cluster by having one major regional hospital to provide a full range of acute and specialist services, and a number of smaller district hospitals specializing in secondary and

sub-acute services, or other convalescent and rehabilitation services. In each cluster, the regional hospital is the largest in terms of staffing, hospital beds and in-patient cases (Hospital Authority, 2012). It is more likely for potential respondents working in these regional hospitals to handle perplexing or complicated patient problems that require sense-making and thus have more lived experience to share. In this regard, regional hospitals were selected as the sample sites. However, one hospital cluster only provides psychiatric hospital services and thus does not have internal medicine and general surgical wards. It was excluded from the sample. As a result, only six regional public hospitals were covered.

The potential participants were recruited in the following ways:

1. Starting from February to March 2008, a letter that described the purpose of the research, the research method together with the preliminary consent form and the list of interview questions was sent to the Chief of Service of Internal Medicine and Surgery of each of the six regional hospitals to seek their help to invite all their staff members working in the same internal medicine or general surgical ward to participate in the interview research. The sample letter is in Appendix 4.1. The list of interview questions is in Appendix 4.5. The Chief of Service of both Departments were asked to distribute the letter and questions to their staff to inform them about the research and to give time to them for consideration before making any personal contact with individual staff.
2. Personal phone calls or on-site face-to-face visits were paid to the Chief of Service whenever possible to elaborate again my research methodology, and to ensure that, with senior management support, the whole team would be engaged with the research and persuaded of my sincerity and credibility.

3. Finally, four regional hospitals responded actively to this research. They are Prince of Wales Hospital (the teaching hospital of one of the medical schools in Hong Kong), Princess Margaret Hospital, Tuen Mun Hospital and Queen Elizabeth Hospital. There is no particular reason to include a teaching hospital. It is just one of the regional hospitals included in the sampling plan. But in actuality, healthcare professionals working in the teaching hospitals were more responsive to the research as they are more involved with research activities generally.
4. After obtaining the consent of the Head and the staff name list of both doctors and nurses working in the ward, the potential respondents were contacted by phone first, followed up by an e-mail with an attachment for the Participant Information Sheet in Appendix 4.2 to detail the purpose of the research, the research design, method of conducting the research and the measures taken to keep confidential the data collected about participants. When the respondent confirmed willingness to participate in the research, the exact date and venue most convenient to them was negotiated. Since doctors generally do not stay in the ward for a long time and the ward round was not a convenient time for them, most doctors opted to visit the medical library in which I was working to attend the interview. A small room in the medical library was especially reserved for the interview so that there were only the respondent and myself as the interviewer. Most nurses chose to conduct the interview in the ward in which they were working.
5. Doctors and nurses in private hospitals were contacted mainly by referrals. At first, letters like the sample in Appendix 4.1 were sent to private hospitals, but the response was not encouraging. Thus, some previous public hospital doctors that have been moved to the private sector and the Hong Kong Private Hospitals Association (<http://www.privatehospitals.org.hk/en/index.htm>) were contacted to help in seeking

referrals. Through various referrals, a couple of doctors and nurses finally agreed to participate. The interviews for doctors were all conducted in their workplace, either in the hospital or in their own clinics. Those for nurses were mostly conducted in the medical library. Only one case had to be conducted over the phone.

The research did not have an easy start. Doctors in Hong Kong are very busy all the time and they are often called to handle emergency cases. Requesting them to spare an hour for the interview might seem difficult if not impossible. Very often, the interview date needed to be changed several times. Nurses are equally busy and they are not as flexible as doctors for time arrangements when they are on duty. Thus, it was crucial to obtain the consent of their Ward Manager, who, in the capacity as being the supervisor of all nurses in the ward, is able to re-arrange the shift of the respondent nurse to fit the interview schedule.

Another major difficulty was that some respondents misunderstood the research design. Given the rich clinical experience of some senior doctors in their own specialty, they did not think that they had any medical cases that had produced confusion or perplexity in the recent past. Some insisted that most of the cases they encountered were not difficult to them if not routine and were thus within their knowledge and experience that did not require any sense-making. To address this issue, the interviewing guide was revised to include examples for clarifying the meaning of perplexing medical cases. It was stated that the case could be an unusual one that made an impression on them; the patient was unusual in a particular way, or they noticed that the treatment was not working as well as they thought it should. These clarifications were made on the follow-up phone call when it was sensed that the respondent was unsure of the scope of the interview. This change proved successful as I was able to recruit more respondents.

Through the above sampling process, a total of 43 respondents were recruited. However, five respondents were unable to recall a specific patient case and just generally replied to the interview questions. Thus, they were excluded from the analysis, but reference will be made to their interviews as and when needed. The final sample consisted of 38 respondents coming from three regional public hospitals and a number of private hospitals. Their key demographic characteristics are listed in Appendix 4.3 with a summary in Appendix 4.4. These characteristics will not be used in the data analysis as the unit of analysis is the individual-in-situation. They are provided to give an overview of the demographic distribution of the respondents. In brief, there were 18 females and 20 males, aged from 26 to over 55 but mostly aged 36 to 45 (44.74% of the total no. of respondents) and 31 to 35 (21.05%) with 10 - 25 years of experience in healthcare (60.53%), an average of 16.38 years. They should therefore have sufficient real life experience in the care of patients to share. About 60.53% were physicians and the rest were nurses, the majority of whom (78.95%) worked in public hospitals in the rank ranging from the most junior Resident and Registered Nurse to the most senior Chief of Service / Consultant and Ward Manager. The respondents covered a wide range of specialties: 11 from Neurology, 10 from Hepato-Biliary & Pancreatic Surgery, 5 from Neurosurgery, 4 from Colorectal Surgery, 2 from Gastroenterology & Hepatology, 2 from Hepatobiliary & Pancreatic Surgery, 2 from Urology, 1 from Cardiology and 1 from Intensive Care Unit. These characteristics are also shown in the chart in Figure 4.2 below.

There was no plan of a minimum or maximum number of samples. Data collection stopped once the level of theoretical saturation was reached. That is, until there is no new or relevant data emerges regarding a category and the category is well developed in terms of its properties and dimensions demonstrating variation; and well-established and validated

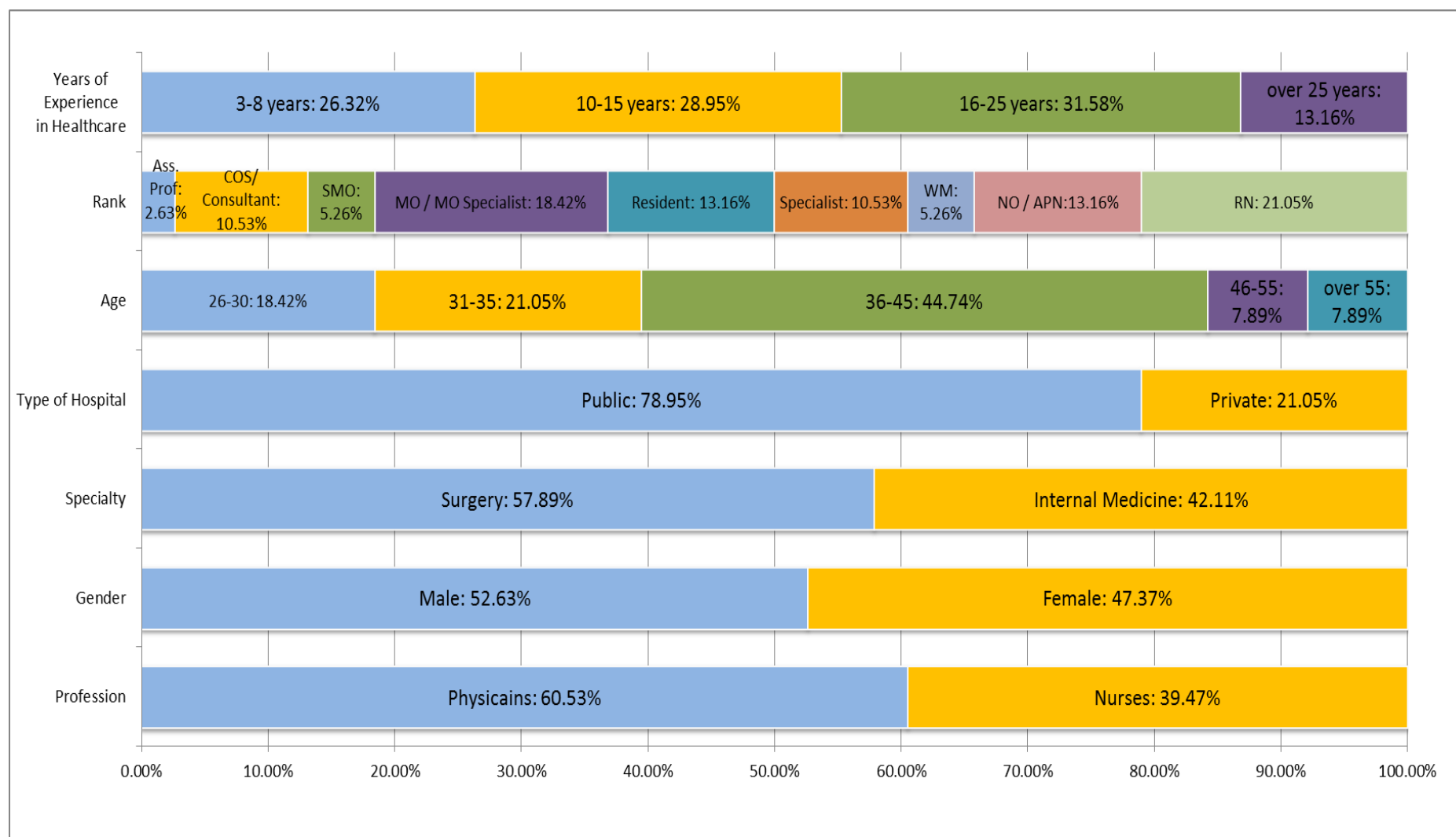


Figure 4.2 Demographic Characteristics of Respondents

relationships among categories (Bryman, 2004, p. 305). Guided by this approach, I stopped recruiting participants when there was no new patterns emerging from the data. Each interview was therefore reviewed immediately after the interview has been conducted, and assessed whether more interviews were needed to confirm or reject new patterns emerging from the respondents interviewed.

4.6 Data Collection Methods

4.6.1 The Interview Method

As explained in Chapter Three and the sections above, SMM's Micro-Moment Timeline Interview was adopted as the interviewing method. All the principles of time-line were observed strictly. An interview guide (Appendix 4.5) was compiled to guide the course of the interview to ensure the same interview protocol was applied to all interviews.

I myself was the principal investigator in conducting all face-to-face interviews from March to September 2008 in Hong Kong. To familiarize myself with the interviewing skills required to obtain quality sense-making data, I wrote to seek advice from Professor Derwin, and Dr. Cheuk who had made use of SMM in several sense-making studies. All SMM literatures were studied. I also took several evening classes on qualitative interviewing in a local university. After a few interviews, I became familiar with the interviewing approach.

Before the start of the interview, I would briefly introduce myself and the research project such as the purpose, its importance and how the interview will be conducted in order to build up initial rapport and trust with the respondent. In case the respondent was not at ease, I would start with small talk and chat with them in a friendly tone as a warm up. Time-Line interviewing is a kind of qualitative interviewing which is based in conversation, with the

emphasis on researchers asking questions and listening, and respondents answering (Warren, 2001, p. 83). The rapport between respondents and interviewers plays a large role in the interview process. A good rapport will gain the respondent's cooperation to complete an interview (Carley-Baxter, 2008, p. 744; Berg, 2007, p. 117). And in Time-Line interview, it is especially important to build up trust with the respondent so that he or she feels comfortable to immerse himself or herself and think deeply the sense-making questions asked. This is iterated repeatedly by Dervin (2008a, p. 15).

After opening up the dialogue, the respondent was invited to complete the consent form in Appendix 4.6 which informed them of their rights in this study, which included their rights to join the study voluntarily, the rights to withdraw at any time, the rights to allow the audio-taping of the interview and the rights to allow processing of the interview content by third parties. They were also invited to complete the demographic data record sheet in Appendix 4.7 to collect basic demographic data such as gender, age, specialty, positional, educational level, their experience and their knowledge of EBM, etc. in order to arrive at general understanding of the background of the respondents. They did not form part of the core data analysis. These key demographic characteristics are listed in Appendices 4.3 and 4.4

The formal interview started after the initial warm up and preparation. It started with asking the respondent to recall one patient case they have handled in the past 12 months that produced perplexity, doubt, or confusion, or in which they felt they were blocked (in time-space moment) where new sense making was required. However, in the first few interviews, the respondents seemed not understand the methodology and failed to recall a specific patient case that produced confusion and perplexity. Instead they just talked about the general phenomenon. At the end, five interviews of this kind had to be excluded from empirical

analysis. To address this problem, the interview questions were slightly modified to ask them to think about a recent case that was unusual or in which the patient was unusual in a particular way or a case that really made an impression on them. Examples were included to illustrate what these might be: “the usual treatment was not working as well as they thought it should be”. Alternatively, two nurses at management grade requested to talk about some ward management situations they had experienced with difficulties instead of a patient case. This was also allowed after confirming that their work is more related with ward management.

After the respondents had identified the situation that produced confusion and perplexity, they were asked to describe the case first and then each step they went through to handle the case in details. At each sense-making moment, the same set of questions focusing on the situation, the gap, the gap-bridging strategies and the helps or hurts in Appendix 4.5 was repeated. However, questions were not asked in a linear sequence. They were adapted according to the question-answering style of the respondent, and whether they might have expressed their views to some questions when they answered others. Thus, it is essential to exercise active listening and reflective listening skills. Those questions that were answered were not repeated. In reflective listening, the respondents were asked to check that this was what they have narrated – “Is the really difficult part to finding the answer was...?”. The paraphrasing was done to check that my interpretation of what the respondents said was what the respondent appeared to mean. Reflective listening is a listening skill associated with counselling but for qualitative research such listening skills help to maintain rapport with the interviewee as well as ensuring that the interviewer and interviewee understand each other.

Besides those questions surrounding the Sense-Making Triangle, additional questions were posed about how the respondents related themselves to others such as “Do you think your

colleagues will have the same interpretation?”, and in what way the answer to the gap they faced helped creating knowledge such as “Has the answer created new knowledge to you?”, and “In what ways did you put the answer into clinical practice?”. Respondents working in the same ward were also asked why they did not pick the same patient case that had caused confusion to one of their colleagues. This can provide further information on how different professionals construct their own worlds and perceive their own discontinuities in the time-space movement in both personal and social context.

The term “information” was not used as far as possible, but if it had to be used, its meaning was clarified in order to avoid any misinterpretation. For instance, it was stated that information was referred to the answer the respondent got to the questions he or she asked, or it was anything that the respondent resorted to in order to address the confusion and muddles facing them.

After the interview, they were also invited to share what they thought about the interview and if there was any supplementary information they wished to add to what they had already recalled in the interview. Most respondents were so busy that they had to leave or were called to leave after the interview had been completed. But one respondent commented that the interview was too long especially for nurses who have a tight schedule in day time. Subsequently the interview time was shortened as much as possible in order to attract more nurses to participate. Finally, all respondents were presented with a small gift to thank for their time. They were also informed that the transcript of the interview would be sent to them for verification and information.

All interviews were taped-recorded upon the permission of the respondents. Each interview lasted for more than 60 minutes on average, with the shortest being 30 minutes and the longest being 152 minutes. It should be noted that all interviews were conducted in Cantonese. This is one of the measures to encourage response from respondents. All respondents were Chinese. Since Cantonese is their main language, they would feel more comfortable speaking in their mother tongue. This would also allow them to articulate their experience without any obstruction. Nevertheless, most expressed medical terms in English because of their education and work practice. In addition, allowing the use of respondents' mother tongue is also a measure to comply with SMM's mandates to conduct interviews, that is, building trust and willingness to disclose (Dervin, 2008a, p. 15). Other than conducting the interviews in Cantonese, all other correspondence with respondents including e-mails were in English.

All the audio-taped interviews were listened to once after the interview. Follow-up e-mails were sent to some respondents to clear up any queries found. One of the respondents even agreed to interview again to provide more details.

To help triangulate the interview data, I also took part three times as an ethnographic researcher, non-participant observer in the ward round of a surgical ward where the research was conducted. Audio-taping of the conversations and dialogue on handling the patient case were not allowed as the patients were in the ward. Thus, I took notes on my observations especially those that provided matches for sense-making of the case. A small number of staff members were invited to attend a semi-structured interview. However, they did not allow taping the interviews, thus, only notes were taken. All these data are referenced in the final data analysis.

4.6.2 Data Processing

All the audio-taped interviews were transcribed in verbatim in Chinese with the help of a medical student helper. A total of 921 A-4 sized pages of text were generated, which means an average of 24 pages per interview. Each transcription was numbered, notes added for the date, time, place for the interview, and the rank and hospital of the respondent for proper record and easy identification of each interview. An excerpt of an interview is presented in Appendix 4.8.

All the transcription text files were loaded onto NVivo (version 9) software for analysis. Using computer software like NVivo was chiefly to increase the effectiveness and efficiency of managing the voluminous amount of data generated in this study. Bazeley and Jackson (2013) highly recommended NVivo which was claimed a software “developed by researchers, and continues to be developed with extensive researcher feedback to support researchers in the varied ways they work with data” (p. 2). It is intended to release some of the researcher’s time in managing the data, thus, allowing increased focus on ways of learning from the data. The software has a wide range of features to enable researchers to track, query, visualize and report data. It is not simply designed for qualitative research. The counting of references from the codes and the matrix coding query will present a table of numerical data for understanding the data in a quantitative way. In addition to these strengths, NVivo was selected because it is Unicode-based and thus is able to handle Chinese.

4.6.3 Ethical Considerations

In undertaking research, particularly qualitative research, Berg (2007, p. 53) argued that researchers have an ethical obligation to their subjects because the research will delve into the social lives of other human beings. These obligations revolve around various issues of harm,

consent, privacy and confidentiality of data. The following measures were taken to address ethical concerns:

1. Informed Consent – It means “the knowing consent of individuals to participate as an exercise of their choice” (Berg, 2007, p. 78). In this research, all the rights of the participants were written down in the Consent Form each respondent was clarified and invited to sign prior to the interview. They were also given sufficient time to consider whether to join the study or not.
2. Privacy and Confidentiality of data -
 - a. All information collected about respondents during the course of this research was kept strictly confidential. All personal data were made anonymous in the transcript. In case their names were mentioned in the interview, it was recorded as Dr. A or X in the transcript. Their names or identifying characteristics will not appear in any thesis or report resulting from this study.
 - b. All respondents were sent a copy of the transcript of the interview to give them an opportunity to review the accuracy of the conversation and to add or clarify points if they wish.
 - c. The transcripts of the interview together with the tape recordings were retained in their original form and kept securely in a locked filing cabinet accessible to me only. The files for the data collected were kept in a standalone and password-protected home computer.
 - d. The transcript of the interview together with the tape recordings will not be kept longer than necessary. They will be destroyed after the completion of this study.

4.7 Data Analysis and Coding Procedure

Data analysis for this research focused on the 38 interview transcription files, totally 921 pages. Data analysis is the most critical and complex part of all phases of a qualitative research project. It refers to the procedures used to interpret and organize the rich data collected from the data collection methods (Strauss & Corbin, 1998, p. 12), with the goal to uncover emerging themes, patterns, concepts, insights, and understandings as Patton (2002, p. 432) reiterated. However, there is only guidance but no recipe to show how this should be done (Patton, 2002, p. 432). Most scholars (Bazeley, 2003; Miles & Huberman, 1994; Patton, 2002; Strauss & Corbin, 1998) concurred that the procedure largely consists of conceptualizing and reducing data, sifting trivia from significance, identifying significant patterns, and relating through a series of propositional statements. These procedures are often referred to as coding (Strauss & Corbin, 1998, p.12). Coding is in fact a fundamental skill for qualitative data analysis. It is a form of content analysis, which Patton (2002, p. 463) suggested as the process of identifying, categorizing and labeling the primary patterns in the interview data. The aim of SMM data analysis also shares the same purpose: “The aim of the Sense-Making-informed analysis is to provide contextually unique detail and a means of ordering unique lived experience in terms of universal categories of movement” (Dervin & Frenette, 2003, p. 241). Dervin also adopted content analysis in her studies to put the verbal answers of respondents into categories which she consider to be the same versus different. Many of the universal verbing categories of SMM such as the situation movement state were developed by “intersecting a deductive set of framework based on Sense-Making’s verbing analytic with the inductive qualities of the data” (Dervin & Frenette, 2003, p. 242; Dervin & Clark, 1987, p. 415; Dervin et al, 2006). This research also took the same coding approach to develop the coding scheme and derive answers to these two research questions: how

knowledge is created and how it is shared to others and the use made of that knowledge. This section discusses the major coding procedures undertaken in this research.

4.7.1 Identifying Unit of Analysis

As informed by SMM, the unit of analysis is not the respondent, but the individual-in-situation, the situation a respondent experienced in taking care of a patient or handling a piece of hospital work. Each time-line step in a situation is conceptualized as the specific time-space moment when the respondent came across a gap that needed to be bridged in order to move forward. The bridge could be constructed by resorting to habits and routines, in which case no new knowledge was created, or by making new responses, that would add to his or her knowledge set. The unit of analysis in the present research is this particular knowledge-creating or non-knowledge creating moment identified in each time-line step. This interviewing approach is considered “the deepest dig into a single situation” (Dervin, 2008a, p. 23) and is graphically represented in the following diagram:

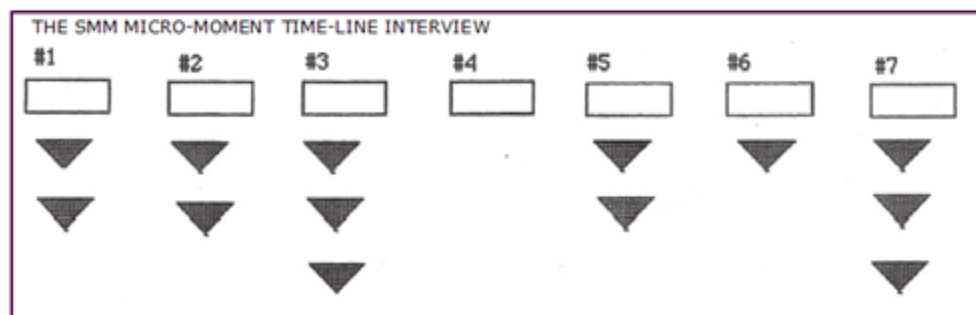


Figure 4.3 SMM Micro-Moment Time-Line Interview (Adapted from Dervin, 2008a, p. 24)

To do this, each interview transcript was read again and again before the actual coding in order to identify all the time-line steps a respondent took in the care of a patient or handling the ward problem. All the responses of the respondent and questions asked relating to one

time-line step were grouped into a unit of analysis. For each of these situations, the SMM triangle of situations, gaps and helps together with the gap-bridging strategies and whether knowledge was created as informed by the respondent was further explored to determine whether it was a knowledge-creating situation or a non-knowledge-creating situation. It was then coded as “Situation 1-K-21” where:

- “Situation 1” denoted the position of the time-line step in the situation; 1 meant the first time-line step, 2 meant the second time-line step, etc.;
- “K” denoted it was a knowledge-creating situation; “N” was used for a non-knowledge-creating situation; and
- “21” was the respondent number

An example demonstrating how a unit of analysis was identified is presented in Appendix 4.9. Those portions of questions and responses to the same time-line step were highlighted in the same color. They were then grouped together and saved as a separate file before importing into NVivo for coding and analysis. In the present study, a total of 100 units of analysis were identified by this method, with 70 being knowledge-creating situations and 30 being non-knowledge-creating situations. This category of situation, including both knowledge-creating and non-knowledge-creating, constitutes the unit of analysis in this research and both were compared to derive the process of knowledge creation. This would answer Research Question One. These units of analysis also constitute the criterion variables for knowledge creation.

4.7.2 Identifying Coding Categories

Once the unit of analysis was identified, the next step was to code the data in each unit of analysis. The interview transcripts in Chinese were used as there was a concern that the translation into English might lose some depth of the interview content. But all the coding labels derived were in English for the purposes of the thesis. Like other Sense-Making

studies, the coding strategy is content analysis (Kari, 2001, p. 57; Schamber, 2000). The SMM categories were applied deductively to provide the general framework to capture the sense-making moment, in which gaps were experienced in a gappy situation, bridge was built by resorting to various strategies and inputs, and the resulting helps or hurts are got. The coding labels in each SMM category were derived inductively from the natural-language data in the interview transcript texts because there was no previous Sense-Making study on knowledge creation, sharing and utilization in healthcare organizations. Some coding labels, however, were also the outcome of the deductive use of codes mentioned in previous SMM studies. Examples are the categories of situation movement state and helps.

The process of developing the appropriate coding categories was highly iterative. First, from the literature review, and considering the nature of the current study, broad SMM categories were employed for coding initially. They are: situation, situation movement state (it means the different qualitative ways in which the respondent sees his or her movement through time-space blocked (Dervin, 2003a, p. 260)), knowledge gaps (the 5W, and descriptive focus), gap-bridging strategies, success in gap-bridging, helps, hurts, knowledge sources of inputs, relevance of sources of inputs. Other inductively-developed categories were “new knowledge created” and “knowledge-sharing”.

Second, this initial set of categories was tested with 15 interview transcripts to initially identify possible coding labels within each category. I started from the most general level by reading and examining each word, phrase and sentence in each unit of analysis carefully and assigning them to as many appropriate broad categories as possible. In case I did not understand the patient case in the interview, I would read relevant literature until I fully grasped the situation faced by the respondent. After the general level of coding, inductively-

developed coding labels were assigned to each of these text units. The coding labels were either taken directly from the actual words or phrases used by the respondent, which were subsequently translated into English, or drawn from the meanings implicit in the respondent's most emphasized responses. These coding labels were the smallest meaningful level identified. I purposely started the coding from the smallest category level as this would help keep track of the original meaning.

An example showing how relevant texts in each unit of analysis were coded in NVivo is presented in Figure 4.4 below. The text relating to Situation 1-K of this interview excerpt as indicated in Appendix 4.9 were all grouped together and imported into NVivo for coding. In this interview, the respondent faced the dilemma in applying appropriate treatment to a patient diagnosed with both pulmonary embolism showing an indication for anti-coagulants and hematoma causing internal bleeding which is a contraindication for anti-coagulants. After reading all the texts from the first word in this unit, those seemed relevant to the SMM categories were coded first. As a result, the following texts were coded with category "Situation Focus":

- 咁其實响呢個時候已經有一個 **dilemma** 喺度，首先唔講話究竟佢個 **hematoma** 喺邊度嚟，**dilemma** 已經係佢有 **history of PE**，咁佢就需要 **anti-coagulation**，但係佢依家**流血 [bleeding]** 㗎，我哋又俾 **anti-coagulation**，咁咪會流多啲囉，但係我哋停咗啲 **anti-coagulation**，又驚佢 **PE** 㗎咁。咁變咗佢依家 有一個 **contraindication for anti-coagulation**，又有一個 **indication for anti-coagulation**...

Their meanings as well as the words and phrases used were further analyzed in order to induce the appropriate coding labels. All the related words and phrases were marked as shown above. It was obvious that the respondent was facing a situation of treatment dilemma. Thus, the coding label "treatment dilemma" was assigned to the above paragraph. The same coding logic and procedure were applied to the rest of the text to derive other coding labels.

The following two diagrams from NVivo illustrate all the coding labels used for the extracted text.

Figure 4.4 Coding in NVivo

The figure displays two screenshots of the NVivo software interface, illustrating the application of coding labels to text excerpts. Both screenshots show a text excerpt on the left and a list of coding labels on the right, along with a 'Coding Density' bar.

Screenshot 1 (Top):

- Text Excerpt:** R: 我認半年前度, 咁有個三十四歲嘅女士, 就嗰嗰生完BB幾個月, 咁佢 heart health就 unremarkable。不過咁佢生完BB之後呢就有個 complication, 就係有 DVT (deep-venous thrombosis) 同埋有 pulmonary embolism (PE), 咁就俾咗 Warfarin 佢食。咁其實 pregnancy itself就咁認都係 risk factor for DVT, 有得 DVT 亦都有個風險會 PE。咁就食緊 Warfarin。咁佢點解佢會嚟到 surgical ward, 就係因為佢有一日好肚痛, certain onset abdominal pain、肚漲呀、vital signs 都掙啲、pulse 又快呀咁樣, 入到嚟就肚漲啦 upper abdomen 尤其是, haemoglobin 都有啲貧血咁樣啦, 血色素下降, resuscitate 過咗, CT abdomen就有個hematoma 喺個 upper abdomen 個度, 唔係好清楚 arise from 邊度其實, 又近著 pancreas, 又近...又有啲近著胃, 唔係好 sure 响邊度嚟, 咁其實响呢個時候已經有一個 dilemma 喺度, 首先唔講話究竟佢個 hematoma 喺邊度嚟, dilemma 已經係佢有 history of PE, 咁佢就需要 anti-coagulation, 但係佢依家流血咯, 我哋又俾 anti-coagulation, 咁咪會流多啲囉, 但係我哋俾咗啲anti-coagulation, 又驚佢 PE 咯咁。咁隻咗佢依家有一個 contraindication for anti-coagulation, 又有一個 indication for anti-coagulation, 咁其實 literature 都講緊話, 如果有人需要 anti-coagulation, 但同時佢又有 contraindication for anti-coagulants, 咁係可以考慮用 IVC filter (inferior vena cava filter) 咁咁樣。
- Text Excerpt:** I: 咁我問番少少我唔係好明啲啲啦, 比較 details 啲啲。咁我想問吓你第一次見到嗰病人個個時候呢, 佢個個狀況係點樣呀? 即係你幾時係... 你係佢嘅主診醫生呀,
- Coding Labels:**
 - Decision
 - Treatment Dilemma
 - Need to assess the appropriateness of Therapy (Interpretation)
 - Reading or Searching for general information
 - With the Whole Team
 - With Supervisors or Seniors

Screenshot 2 (Bottom):

- Text Excerpt:** R: 咁大家就...問題就係我要...我認第一個關心就係點樣可以停止流血啦, 需唔需要做手術啦? 即係需唔需一個即時嘅手術去止血啦, 定係 conservative, correct 咗啲啲因為俾咗 anti-coagulation 嘅 angiography, correct 咗就得咁咁。咁另外一個問題就係, 呀, 點解個度會流血呢咁樣? 好多人都食 anti-coagulation, 間唔中都有啲人真係 overdose 咗, 但係啲啲人都唔會流血, 咁點解佢會流血呢?
- Text Excerpt:** I: 咁你哋當時點樣解決呢幾個問題呀?
- Text Excerpt:** R: 咁...其實都係大家成個 team 一齊討論, 咁我哋 team 亦都有好多...好有 experience、好有 knowledge 嘅 senior, 咁大家討論囉。如果有陣時討論無乜結果, 或者...基本上好多時我哋真係有一、兩個senior, 其實佢哋真係好 update knowledge, 佢哋甚至 quote 到話近來有乜 studies 做過呀, 有啲咁嘅 example 可以咁做呀。
- Text Excerpt:** I: 你話啲literature呢, 你當時係 consult 過乜嘢 literature?
- Text Excerpt:** R: 我又quote 唔到邊張紙 (publication) 咯。
- Text Excerpt:** I: 即係例如邊個 source 呀? 或者journal 呀定係書呀定係database呀啲啲?
- Text Excerpt:** R: 我認其實我哋通常都係睇 database 囉, 最容易搵個係 PubMed
- Coding Labels:**
 - Decision
 - Treatment Dilemma
 - Need to assess the appropriateness of Therapy (Interpretation)
 - Reading or Searching for general information
 - With the Whole Team
 - With Supervisors or Seniors

Figure 4.4 Coding in NVivo

This initial set of coding labels were reviewed and modified at different times by removing the unnecessary ones, grouping similar ones together into a new sub-category or developing new ones to accommodate new concepts emerged in the review. These main categories and

coding labels were organized in a hierarchy as tree nodes in NVivo. Other coding labels organized as free nodes in NVivo were also used to capture related themes that were perceived useful for analysis but could not be incorporated into the main coding structure in the tree node. These themes included ideas about EBM issues, KM, their knowledge sharing attitude, power issues, etc. In order to keep track of my thoughts on coding as it was done at different times, they were recorded in the memos in NVivo so that they could be referenced conveniently during coding. The new set of coding labels was then applied to another five interview transcripts for further testing and review. This was also sent to my PhD supervisor for comments from time to time. This was one of the measures to ensure consistency of coding. All the 20 interview transcripts were then re-analyzed and re-coded with the new set of categories and coding labels. Whenever similar codes were collapsed into a new group or new coding labels were added, all the previous coded transcripts were reviewed and re-coded. Being the only coder for this research, I went through five rounds of this kind of iterative analysis, review and re-coding at different times until each code carried an unique meaning and all the codable texts were assigned with appropriate categories and coding labels. Again, this was to enhance the consistency of coding. The outcome was a new set of revised categories and coding labels which changed substantially from the initial set. This was then applied to the rest of the interview transcripts.

The above complex and iterative process produced the preliminary coding schemes. To stabilize their meanings further, and to ensure the reliability and trustworthiness of coding, all the coded texts were reviewed again to identify if there were any concepts not coded in the same coding logic, or any extreme cases that should be coded separately in a new coding or sub-category. This last round of review also resulted in a number of changes to the coding schemes, finally developing the coding schemes. Appendix 4.10 presents the coding schemes

for the 10 main categories and 3 different levels of sub-categories making up from 199 coding labels. Because of space limits in this thesis, other less core categories and free nodes cannot be presented. They were used for analysis and reported in Chapter Five. Similarly, four main categories were selected to illustrate the formation of the codebook in Appendix 4.11 and the use of the specific coding labels.

4.7.3 Coding Schemes and Analysis Approach

The section reports the analysis approach for the main categories of the coding schemes:

(A) Situation Focus:

Situation refers to the starting or jumping off point for the respondent that would lead to the gap(s) to be overcome (Dervin et al, 2006, p. 3). It provides the overall context and background for the respondent to assess his or her current position in the journey and how to move forward. The coding was to tap the substantive focus of the problem or struggle the respondent faced in order to understand what healthcare professionals focused on when there was knowledge creation and sharing. Therefore, the coding labels were derived from the description of the respondent at the micro level by considering the difficulties of the clinical case or the macro environment the respondent was positioned when he or she entered into the situation. The label “**Situation Focus**” was adopted for this main category. Accordingly, as shown in Appendix 4.11, 24 sub-categories were developed. Their definitions are also provided. Different levels of sub-category are used in the analysis and results reported in Chapter Five.

Since each unit of analysis was a time-line step with a unique situation focus, each (n=100) was coded into one sub-category only.

(B) Situation Movement State

Situation Movement State is the means of “analyzing how people saw themselves as moving within the situation, over the gaps, building bridges, and finding information” (Dervin et al., 2006, p. 46). It is different from Situation Focus in that it serves as the situation entry for the respondent and captures “cognitive aspects of movement in time-space bound moments based upon what people do and what they think or worry about at each step” (Kim, 2005, p., 486). It is thus more revealing than situation focus to illustrate the particular state the respondent saw themselves in face of a gap. In this regard, it can be used to analyze its relations with knowledge creation such that whether it can predict under what situation new knowledge will be created or not.

Since situation movement state has a long history with SMM studies, the coding labels were developed both deductively from SMM studies and inductively from the descriptions of the respondent. A total of 10 sub-categories were developed. The definitions and use are provided in Appendix 4.11.

While it is recognized that a respondent might have encountered a number of issues stopping him or drifting him to other directions, coding this to different sub-categories just makes analysis difficult. Therefore, each unit of analysis was coded into one sub-category only.

(C) Knowledge Gaps

Gap is another core element of the Sense-Making triangle. It was the queries, confusions, riddles and muddles that the respondent faced. This was articulated in the form of critical questions or problem statements. This dimension is crucial to this study as the questions asked or the gap faced would directly lead to the kind of bridge

the respondent built to overcome the gap. Thus, the label “**Knowledge Gaps**” was adopted to indicate what kind of knowledge the respondents need to know or are lacking of. It is used as one of the predictor variables to predict whether knowledge would be created. In many SMM studies, gap was tapped in several dimensions such as 5W focus, valence focus, entity focus, and entity attribute focus (Dervin et al., 2006, p. 6). In this research, only descriptive focus was analyzed as this was considered sufficient to study its relations with whether knowledge can be created. The coding labels were developed inductively from the questions or problem statements articulated by the respondent. A total of 21 coding labels were used. Details are in Appendix 4.11.

From the respondents’ responses, they might need to bridge several gaps in one situation. But these could not be handled all at the same time. The common approach they took was to handle one after the other; and the way a gap was handled might also impact on the definition of the second gap. Therefore, if there were several gaps, they would be analyzed into different units of analysis. Thus, each unit of analysis was coded into one sub-category of knowledge gaps only. If there was no question in knowledge gap, the analysis of other coding categories would stop. There are 3 units of analysis in which “No question” were coded. In the subsequent coding categories, the total number of cases was dropped to 97 only ($n=100-3=97$). This was used in the analysis of other coding categories.

(D) Gap-Bridging Strategies

This coding category is central to this research. In fact, the whole process of sense-making is the process of bridging of gaps. Individuals can use old senses, or construct

new senses with the help of source of knowledge inputs including respondents' previous knowledge and experience. After crossing the bridge and reflecting back the whole process, individuals might come out with certain knowledge or learning. Thus, this SMM element directly informs the way knowledge is created. It is the main predictor variable to study its relations with knowledge creation and the role of informational professionals to facilitate knowledge creation in healthcare teams. This was done to answer Research Question One.

However, this construct was not as thoroughly researched as other constructs with a range of well-established variables such as situation movement state or helps (Kari, 2001, p. 39; Savolainen, 1999, p. 78); there was only an introductory list of verbings and suggested that researchers develop additional verbings tailored to particular research contexts (Dervin, 2003, p. 175; Schaefer & Dervin, 2009, p. 269). This was followed in this study. The coding labels were drawn from the actual thoughts, ideas, actions, and emotions articulated by the respondents in the interview. A total of 36 sub-categories grouped into 8 broad categories were derived.

Another emphasis was the use of the communication-as-procedure framework to categorize the coding labels in an attempt to examine how individual sense-making efforts can be facilitated by or interrupted by macro-level structures, context, and culture (Schaefer and Dervin, 2009, p. 268), which provides answers to Research Question Two. As can be seen from Appendix 4.11, the individual relating to self was labeled “**dealing with self**” and operationally defined as a) accepting reality; b) alerting; c) emoting; d) escaping; e) feeling stressed; and f) making intuitive judgments, testing hypotheses. Individual relating to other individuals was sub-

divided into two labels, namely “**dealing with informal persons (patients or relatives)**” and “**dealing with formal persons**” because of the specific nature of healthcare professions and the need of this research to study knowledge sharing which can be reflected in “dealing with formal persons” such as supervisors and other specialists in the same or a different patient care team. Dealing with informal persons was operationally defined as a) accommodating patients’ requests; b) assessing financial situation of patients; c) assessing patients’ physical conditions; d) assessing patients’ preference; e) clarifying misunderstanding; f) counseling patients or relatives; and g) suggesting advice to patients or relatives. Dealing with formal persons was operationally defined as a) consulting or referring; b) discussing with colleagues; c) negotiating with authorities; and d) reporting to seniors. Individual relating to collectivity was labeled as “**Dealing with institutions**” and was operationally defined as a) checking with drug companies; and b) referring to public hospitals. The rest of the gap-bridging strategies were categorized into “comparing and contrasting scenarios”; “dealing with information”, “doing checks and trials” and “doing tasks”.

In the sub-category “dealing with information”, respondents’ narratives were further analyzed into whether they searched for EBM literature or general literature in order to examine the relevance of EBM literature in bridging healthcare professionals’ knowledge gaps. Attempts were also made to analyze why some gap-bridging strategies were chosen and some were not. This would throw light on the process of knowledge creation.

Snowden also mentioned four types of gap-bridging strategies in his Cynefin Framework: a) sense, categorize, and respond; b) sense, analyze and respond; c) act,

sense, and respond; and d) probe, sense, and respond. Snowden did not provide any means of how this could be used in data analysis. Neither did this research develop any coding category for this because it was considered inappropriate to analyze Snowden's concepts in this way. Instead, the whole sense-making moment will be investigated to examine whether respondents would experience the knowledge domains described by Snowden and their corresponding responses.

A knowledge gap can be overcome by several gap-bridging strategies. One gap-bridging strategy might not be able to provide all the solutions; it might provide a partial solution and trigger the respondent to look for others; or it would fail at first and then the respondent explored other strategies until the gap was bridged. Therefore, each unit of analysis was coded into several sub-categories (n=312).

(E) Success of Gap-bridging Strategies

This coding category refers to whether the gap faced by the respondent can be bridged after acting on the various gap-bridging strategies. There are two labels only: success bridging and unsuccessful bridging. Individual gap-bridging strategies might fail, but if overall, the gap could be bridged after trying several strategies, it was coded as such. Therefore, each unit of analysis was coded into one category only. The three unit of analysis without knowledge gap questions were coded as inapplicable. The inclusion of this category was to analyze whether successful gap-bridging would lead directly to creation of new knowledge.

(F) Knowledge Sources of Inputs

This coding category is related to gap-bridging strategy. As aforementioned, gap-

bridging strategy is different from source-using. They are the elements used by healthcare professionals to bridge situated gaps and create knowledge; they are not the bridges themselves. In Dervin's concept, inputs are not necessarily "information"; they can be anything such as ideas, insights, intuitions, experience, memories, opinions, etc. In this research, special attention was given to whether explicit or tacit knowledge inputs were employed in the generation of new knowledge. This is also to examine the importance of tacit knowledge in relation to EBM practice, which is the main concern of this thesis. Therefore, this category included 5 coding labels based on tacit and explicit dimensions of knowledge. They are:

- a) Explicit knowledge sources: They are defined as those could be "crystallized in the formalisms of words, pictures, formulae, or other articulate devices" (Polanyi, 1969d, p. xv). Accordingly, they can be letters, textbooks, maps, graphs and any documents or reports (Polanyi, 1969x, pp. 144-145). In this study, they include books; health magazines; information from drug companies; internal guidelines; investigation reports; journal articles from MEDLINE; journal articles from PubMed; medical web sites; patients' medical records; and research evidence which referred to EBM literature.
- b) Own Tacit Knowledge, Observations, Thinking, Reflection, and Experience: It is defined as the respondents' own intuitions, gut-feelings, thoughts and ideas, knowledge and experience, and their judgments that cannot be explicitly articulated and exemplified in devices.
- c) Other People's Knowledge or Experience, outside the immediate patient care: In order to study the phenomenon of knowledge sharing, this label was to identify whether respondents made use of the tacit knowledge of other people outside their own patient care team such as external experts, peers, hospital

administrators and other specialists.

- d) Team's Knowledge or Experience: It refers to the tacit knowledge of respondents' own patient care teams such as supervisors and colleagues. Again, the purpose was to study whether there was any knowledge sharing.
- e) Patients or Relatives Opinion: The opinion of patients and their relatives constitute an important source of advice to healthcare professionals that could not be ignored in decision-making. In fact, one of the cornerstones of EBM is the involvement of patients. Thus, this was coded separately in order to understand their roles play in the gap-bridging of healthcare professionals.

Each unit of analysis was coded into several sub-categories depending on what they have described in respondents' narratives.

It was also identified in the narratives of respondents that they would evaluate the importance and usefulness of different sources of inputs. These would be captured as positive or negative evaluations. However, as this was not the main theme of this research, they were only coded whenever evidenced in the narratives.

(G) Helps

Helps is also a key component in the Sense-Making triangle. It refers to the outcome after the knowledge gap has been bridged. It reflects how respondents need to be helped in order to move forward, and essentially what use they could make of the newly created sense. As advised by Dervin et al. (2006),

“Helps is coded metaphorically. You read what the information says reaching for pictures of movement though time-space which the words present to your mind. You must constantly ask yourself- what help did the informant seek at

this point in time-space – for the whole situation? For a specific learning?

For use of a specific source?” (p. 77)

This is how helps was conceptualized in this study. This is to analyze the utilization of knowledge. The coding labels were mainly derived from previous SMM studies plus inductively developed from the respondents’ narratives. A total of 22 sub-categories were developed and, similar to gap-bridging strategies, each unit of analysis was coded into several categories as they would like to be helped in many different ways and put knowledge to many different uses. Helps was also coded no matter whether the gap was successfully bridged or not as new knowledge can be created from failure and people might learn even from unsuccessful gap-bridging.

Each of the sub-categories is defined briefly as follows:

Educate Patients	The respondent has taught, counseled patients or their relatives about the diseases and other related matters.
Educate Staff	The respondent need to educate his or her staff about some essential work information, procedures, etc.
Got Chance	The respondent need to find a right opportunity to do what is critical to them to bridge the knowledge gap.
Got Confidence	The respondent wanted to have or got more confidence.
Got Connected to Others	The respondent wanted to get or has got people to cooperate with him or her to work together.
Got Control of a Bad Situation	The respondent wanted to or has successfully got himself or the patient out of troubles.
Got Directions (Able to plan)	The respondent wanted to have or has got some hints or directions to manage the patient.
Got Evaluation	The respondent wanted to have or has got information to evaluate and justify their care to patients.
Got Hope	The respondent wanted to have or has got something to believe that the future will be bright.
Got Insurance Information	The respondent wanted to have or has got information on the insurance support of the patient.
Got More Time	The respondent wanted to have or has got more time needed to achieve the goals in managing the patient.
Got Patient Consent	The respondent wanted to get or has got informed consent from patients or their relatives on the suggested management plan.
Got Pictures, Ideas, or Understandings	The respondent wanted to have or has got ideas or pictures, and new or revised understanding about the

	diseases, therapy and other related clinical concepts.
Got Pleasure	The respondent wanted to be or felt pleased by the outcomes of the management plan.
Got Protection of Oneself	The respondent wanted to have or has got protection or refuge coming from the inside.
Got Resolutions	The respondent wanted to have or has got solutions to the problem at hand or achieved the goals of the proposed management plan.
Got Resources	The respondent wanted to have or has got more resources in terms of staffing, financial support, equipment, etc he or she needs for moving forward.
Got Skills	The respondent wanted to be equipped with or has got the steps or procedures needed to manage the patient.
Got Support and confirmation	The respondent wanted to have or has got supportive opinion or comments from the sources consulted or information to confirm something uncertain.
Got Updated Information or Guidelines	The respondent wanted to have or has got updated information to solve the problem at hand.
Kept Moving	The respondent was able to continue to move forward down the road and staying on track.
Refreshed Memory	The respondent wanted to be or was refreshed of his memory.

Table 4.1 Definitions of Coding Labels of Helps

(H) Hindrance

Hindrance is another outcome of sense-making. Instead of getting helps, respondents might also encounter difficulties that prevented them from getting more helps. In many SMM studies, it is interpreted as the opposite of helps and thus the focus of analysis is helps. In this study, there is a need to understand what specific difficulties did respondents encounter either in implementing gap-bridging strategies or the use of knowledge of inputs so as to map out a more detailed knowledge creation process. Thus, this coding category with 15 sub-categories was developed inductively from the narratives of respondents. Each unit of analysis was coded into several categories because they may have met different kinds of hindrance. The coding labels were listed in Appendix 4.10.

(I) New Knowledge Created

This coding category is to tap qualitatively the new knowledge respondents claimed to have learnt in each unit of knowledge-creating situation (n=70). The non-knowledge creating situations were not coded. This is to give an overview of what kind of knowledge is created and thus would be shared in healthcare organizations. A total of 31 sub-categories were developed as can be seen from Appendix 4.10. Each unit of analysis was coded into one or more sub-categories because it was likely for respondents to learn different kinds of knowledge in a single situation.

(J) Knowledge Sharing

This coding category is not found in any previous SMM studies as this area was not extensively researched. Only Cheuk and Dervin (2010a) applied SMM assumptions to the implementation of a knowledge-sharing web platform. On the other hand, Snowden's narrative techniques were applied in the study of knowledge sharing by Cheuk (2007a, 2007b). In this research, this coding category is another key area. Research Question Two aims to examine the link between personal and organizational knowledge. As informed by SMM, the moments of communicating links individual knowledge at the micro level to the macro-level structures which in turn "is energized by, maintained, reified, changed and created by individual acts of communicating" (Dervin, 2003f, p. 276). Thus, knowledge sharing is the means through which individual communicatings have something to do with collective communicatings. When a healthcare professional's knowledge is shared with others in the same or different team, they will develop a common understanding of the issue. All differences can be resolved in discussion and debate bringing a new level of

understanding amongst members, and the knowledge so shared and finally created by every staff member of the group will ultimately benefit the whole organization.

Knowledge sharing activities were captured in two different sub-categories: a) inter-professional sharing, which is sharing of knowledge between doctors and nurses; and b) intra-professional sharing, which is sharing amongst the respondent's own professional group. That is, sharing is amongst doctors, and amongst nurses. The strategies used to share knowledge were also coded in 20 sub-categories as listed in Appendix 4.10. Each unit of analysis was coded into several categories as knowledge sharing can be with multiple professional groups using multiple strategies.

Knowledge sharing is heavily influenced by the culture and context of an organization. Dervin warned of the need to look into the power issues. This is a real concern in healthcare organizations as doctors are much more powerful than nurses in hospitals but both must cooperate to provide patient care services. Snowden (2008a) believed that people will not withhold knowledge in the context of real need. His storytelling technique was seen as a powerful tool in organizations to disseminate complex knowledge ideas. In this study, knowledge sharing activities were examined in these aspects. Thus, context in healthcare organizations was also coded.

In addition, the gap-bridging strategies of dealing with formal persons such as discussing with own patient care team members and consulting external experts and peers also reflected knowledge-sharing activities. Some knowledge gaps that are related to institutions such as lack of clear hospital policy and guidelines also reflected to some extent the need for knowledge sharing.

(K) Context

Context constitutes another fundamental construct of knowledge. Thompson and Walsham (2004, as cited in Evans & Alleyne, 2009) argued that “the meaning of all knowledge is tied up within the context of its development” (p. 151). Yet, the concept remains ill-defined and inconsistently applied. Dervin (2003g) describes context as an “unruly beast” difficult to tame methodologically. It “has the potential of being virtually anything that is not defined as the phenomenon of interest... a kind of container in which the phenomenon resides” (p. 112). Besides, both Snowden and Weick place much emphasis on the impact of context on knowledge creation and management. In this study, I’ll take Thompson and Walsham’s (2004, as cited in Evans & Alleyne, 2009) definition: “the relationally situated ingredients through which knowing occur” (p. 151). It helps determine interpretation and also places constraints on the assessment of problem and the selection of strategies to bridge the gap. In turn, the individual might also be able to influence the context, that is, the context is being changed and created by individual’s communicatings in Dervin’s words.

In this research, context refers to institutional policy, institutional resources, culture, power and administrative structures as identified from the respondents’ narratives. It was analyzed from the perspective of its impact on assessment of situation focus, gap-defining, the selection of gap-bridging strategies, the helps got and the hindrance met. The macro environment situated by respondents with reference to Snowden’s five different knowledge domains was also analyzed to see whether his suggested interventions apply. Since no specific question was asked about this, the coding was developed from answers given in various questions such as situation focus,

knowledge gap, gap-bridging strategies, the helps got or hindrance met. Studying context is crucial. Strauss and Corbin (1998) said, "If one studies structure only, then one learns why but not how certain events occurs. If one studies process only, then one understands how persons act / interact but not why" (p. 127). Context is the macro level structure for the micro level process of knowledge creation and sharing to take place.

In addition, it is acknowledged that public hospitals and private hospitals face very different environment in terms of working relations, organizational structure and resources. While the unit of analysis is smaller than a person, analysis will be made to compare the data from public hospitals with that of private hospitals to investigate the impact of context on their sense-making behavior.

On the whole, this research is basically a qualitative study of knowledge creation, sharing and utilization. But it will be supplemented with quantitative analysis of the predictive power of different predictor variables and descriptive statistics to give more robust and clearer pictures.

4.8 Ensuring Trustworthiness of Data Analysis

It is important to establish the worth of a research study so that it can stand up to challenge and of value to others. In qualitative research, scholars (Guba, 1981; Lincoln & Guba, 1985, Silverman, 2005, Bazeley, 2013) speak of achieving trustworthiness in terms of credibility, transferability, dependability and confirmability to ensure it is valid and reliable, concepts that are traditionally applied in quantitative research. In this research, these suggested techniques were incorporated as far as possible to improve its quality.

Credibility means the research is able to measure what is actually intended so that there is confidence in the “truth” of the findings. It is also equivalent to internal validity, which it is regarded the most critical factor in establishing trustworthiness. To achieve this criterion, Dervin’s well-established and well-tested research methods were adopted. SMM has been proved as a vigorous research method in information seeking and use study; it has also been applied in different ways to study KM. Being the principal investigator, I have prolonged engagement with the research participants and the hospitals. I have been a medical librarian for both the HA and a medical school for nearly 15 years at the time of research. The understanding gained of the organization and the research participants enables the building of rapport and trust with the participants within a short period of time before the interview, and keeps me vigilant to detect distortions that might be in the data (Lincoln & Guba, 1985).

Attempts were made to collect data from different sources. Besides the Micro-Moment Time-Line Interview, I also took part as an ethnographic researcher, non-participant observer in the ward round twice to observe in actuality how the doctors and nurses handle patient cases in the ward. Whilst it is far from the truth to say that this observation supports confirmation to the findings of the interview, it is another means to let me understand the actual work environment of the research participants and the interaction amongst them.

In addition, various measures were used to help ensure the honesty of participants. For instance, they were allowed to withdraw from the study at any time without any punishment. The core set of fundamental mandates of SMM to conduct interviews did encourage participants to speak what they really think and feel. They were told to recall an actual experience with deep impression on them so as to elicit their true thoughts. Participants were given the understanding that they did not come to the interview with an answer on the tips of the tongue. They could freely indicate what had been forgotten. In fact, this did occur in the

interview. Given the great number of patients they have to handle a day, it is understandable that they might forget some minute details. Fortunately, forgetfulness appeared as a minuscule problem only.

Frequent discussion was made with my supervisor of this project though this could not be regarded as a formal debriefing session. This kind of discussion was valuable in that “the vision of the investigator may be widened as others bring to bear their experiences and perceptions” (Shenton, 2004, p. 67). The difficulties in undertaking the research were shared and solutions explored. More frequent contact was made at the stage of coding. It could be said that the establishment of the coding scheme was the result of these rounds of discussion and advice.

Further validation was sought through member checking. This is a strategy for confirmation of findings as they are being developed during or at the conclusion of analysis by returning all data, especially interview transcripts, to their sources for validation, correction, or further approval before analysis (Bazeley, 2013, p.89). This is considered the single most important provision that can be made to increase a study’s credibility (Lincoln & Guba, 1985). In this research, all interview transcripts were sent to each participant for verification. Follow-up emails were sent to seek their help to clarify some confusions or misunderstanding. Most of them replied with positive confirmation, some with updates and another one proposed to take another interview. As Bazeley (2013) commented, “When there are issues of fact in question, this can indeed be of value” (p, 90). However, the results of analysis and the observation reports were not sent to them for verification. This might also sound difficult to participants. But given the above measures to ensure credibility of this search, this limitation will not pose great problem to its validity.

Transferability is concerned with the extent to which the findings of one study could be applied to other situations. It refers to the external validity of a research study. Qualitative research is often criticized of its inability to transfer its findings and conclusions to other situations because of its specific context and sometimes, small amount of samples. Limited generalizability is indeed a great limitation for qualitative research. However, Dervin took another view. She pointed out that “the gap-bridging analytic as sense-making is understood and interpreted situationally, but it may be generalized because it is related to a natural human behavior” (Dervin, 2003h, p. 302). Since SMM focuses on the study of the sense-making phenomenon in time-space rather than the person with constant characteristics across time-space, this methodology conversely guarantees a certain extent of generalizability. In this research, the process of knowledge creation, sharing and utilization was analyzed from the knowledge-creating situations healthcare professionals situated at. Since inference was made to the micro situations and not the specific healthcare professional group, the findings can be generalized to other healthcare organizations in Hong Kong or other countries provided that they have similar healthcare systems and practices. Or similar knowledge process can be found in other professional groups in the hospital with similar work practice, or other knowledge-intensive industries with similar characteristics. One obvious example is that the power issues between doctors and issues occur not just in Hong Kong but also reported in other countries (Teekman, 2000, p. 1132). Of course, it is also unlikely to replicate the same results as contextual and cultural factors do have an impact on how healthcare professionals define and bridge the gap. For instance, the Chinese are more conservative and more likely than Westerners to hoard rather than share their knowledge. Therefore, it can be said that there is a limited extent of external validity of this research.

Dependability refers to the reliability of the research which means that the findings are consistent and could be repeated. Again, it poses difficulties to qualitative research because of the changing nature of phenomenon under study. But Lincoln and Guba (1985) argued about the close ties between credibility and dependability so that a demonstration of the former is sufficient to establish the latter. That is, a valid research is also reliable. Another commonly used strategy is to ensure consistency in data coding by requiring a second person to code some portion of the data as a check on the reliability and consistency of the coding work. While this kind of checking is sometimes seen as an indicator of the trustworthiness of the coding process, and as contributing to the reliability of the conclusions drawn from the codes, Bazeley and Jackson (2013, p. 93) questioned the value of doing so in a project with a solo investigator. They claimed that each person approached data coding with their own goals and perspectives. It is very likely for the second coder to see the code differently. I echo this very much. This research made extensive use of SMM and other sense-making theories and interviews were conducted in Hong Kong. The second coder should be familiar with this research methodology, the healthcare context in Hong Kong and Chinese. There is no guarantee to find a suitable second coder that would provide checking on the codes I used. In fact, another strategy of reflexive journal was adopted. The memos in NVivo were used to record my thinking and insights about the research process and the coding approach and to keep track of the major changes in coding and the reasons for the change. An extract is presented in Appendix 4.12.

To ensure coding consistency, my supervisor of the research was requested to review the codes and make amendment. The process of discussion did clarify some of my confusions. The coding was done at least in 5 rounds, resulting in significant changes in the categories

and sub-categories. Coding was also conducted at different times to make sure a fresh mind was available to review the coded text.

Finally, the above strategies of reflexive journal and triangulation are proved useful to ensure confirmability or objectivity of qualitative research. Again, it is difficult to ensure real objectivity as even quantitative research requires the intrusion of human values and inevitably biases the data. The purpose of qualitative research is to focus more on understanding than objectivity.

4.9 Conclusion

This Chapter has outlined Dervin's Sense-Making Methodology employed in this research to investigate the micro process of knowledge creation and utilization in healthcare organizations. SMM was also employed to study the relations of micro sense-making moment with the macro level structures in order to establish the link between individual knowledge and organizational knowledge. The process of knowledge sharing could also be mapped out. Snowden's Cynefin Framework viewed knowledge generation as a sense-making process and described how it happens in the five knowledge domains. It provides the framework for looking into the macro environment healthcare professionals are situated and their corresponding responses. This can help reflect the spread of knowledge in organizations. The research will also examine whether his storytelling and narratives techniques are able to disseminate complex knowledge ideas. Data collection methods were elaborated. Ten major coding categories were identified to inform data analysis. The coding process and analysis approached were also delineated in detail. The next Chapter will report the findings of this study to answer the three research questions proposed in Chapter One.